# Endocrinology

## Board and Certification Review

## 1000 Questions and Explanations

# 2022 edition

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About *Stat*Pearls

## Section 1

Question 1: A 55-year-old male has severe hypercholesterolemia with an LDL-cholesterol of 230mg/dL. He also has a family history of hypercholesterolemia. Genetic studies do not reveal any mutation defect in the LDL receptor gene. Which is the next most frequent cause of this familial hypercholesterolemia?

### Choices:

1. Vitamin E deficiency
2. Familial defective apoB
3. ApoC2 deficiency
4. Gain in function mutation in PCSK9

## Answer: 2 - Familial defective apoB

## Explanations:

- Mutations in PCSK9 can affect LDL-C levels. A very rare cause of familial hypercholesterolemia is a gain in familial mutation since PCSK9 targets the LDL receptor for degradation in lysosomes accounting for less than 1%.
- The protein apocC2 is a co-factor for lipoprotein lipase, and a deficiency causes hypertriglyceridemia and not an increase in LDL-c.
- A familial defective apoB can cause severe familial hypercholesterolemia since the mutation is the LDL receptor binding domain, e.g., position 3500.
- After defects in the LDL receptor, familial defective apoB is the second most prevalent cause of familial hypercholesterolemia, accounting for around 10% of cases.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Biochemistry, Apolipoprotein B

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## Question 2: A 55-year-old male presented with nausea and fatigue. Initial blood tests suggested hypopituitarism with low serum cortisol (40 nmol/L) and accompanying low ACTH, low free T4 7.9 pmol/L (reference range 11.5-22) pmol/L) and inappropriately normal TSH (1.4 mU/L reference range 0.35-5.3 mU/L). Gonadotrophins were inappropriately low for a post-menopausal woman. CT scan was normal. Iron studies performed showed an increase iron saturation of 65% (30% to 50%) with a raised ferritin and liver function tests showed mildly increased transaminases and fasting blood glucose was 155 mg/dl ( normal 108 mg/dL). What is the most likely cause of hypopituitarism?

## Choices:

1. Pituitary adenoma
2. Pituitary apoplexy
3. Hemochromatosis
4. Craniopharyngioma

## Answer: 3 - Hemochromatosis

## Explanations:

- Hemochromatosis causes pituitary hypofunction by depositing iron in the anterior pituitary.
- CT of the brain imaging studies in patients with hemochromatosis are usually normal.
- Increased iron saturation and increased ferritin together with raised liver enzymes are typical findings in hemochromatosis.
- The increased fasting blood glucose is another feature that can be found in hemochromatosis. Patients developed diabetes mellitus due to the destruction of the pancreas by the iron deposition.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hypopituitarism

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## Question 3: A 65-year-old male with a past medical history of coronary artery disease, hypertension, and diabetes mellitus type 2 presents to your clinic regarding possible testosterone replacement therapy. The patient has known primary hypogonadism. Five months ago he underwent percutaneous coronary intervention (PCI) for myocardial infarction. He complains of persistent fatigue, memory loss, and erectile dysfunction. Which hormone replacement strategy should be used in this patient?

## Choices:

1. Testosterone gel
2. Oral testosterone pill
3. None at this time
4. Testosterone pellets

## Answer: 3 - None at this time

## Explanations:

- Contraindications to androgen replacement therapy include a history of breast cancer, prostate cancer, uncontrolled heart failure, myocardial infarction or cerebrovascular accident within past 6 months, untreated obstructive sleep apnea, having a hematocrit over 48%, men planning fertility, having a palpable undiagnosed prostate nodule, an elevated PSA (prostate specific antigen) above 4 ng/mL, or an elevated PSA level above 3 ng/mL in high-risk patients including African Americans and men with a first-degree relative with prostate cancer
- Testosterone gels generally are recommended due to patient preference, cost, convenience, and insurance coverage. The major advantage of gels is the maintenance of stable serum testosterone concentrations resulting in stable libido, energy, and mood.
- Serum PSA levels can increase in response to testosterone treatment; therefore, it is important to rule out prostate cancer before starting therapy, as it can worsen the disease process. Patients on replacement therapy need to be reevaluated for prostate cancer at 3 months and 1 year after beginning treatment.
- Hyperestrogenism can be an adverse effect of replacement therapy due to the fact that testosterone can be aromatized to estrogen.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Androgen Replacement

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## Question 4:

A 30-year-old female with a past medical history of Graves' disease presents to your clinic complaining of recurrent nausea and vomiting. Physical exam reveals a pleasant woman in no visible distress other than the occasional grimace from nausea. The lungs are clear to auscultation bilaterally, heart rate is borderline tachycardic, and a 1/6 systolic murmur is appreciated on examination. She is currently taking methimazole for her hyperthyroidism. A urine beta-hCG demonstrates that she is pregnant. An ultrasound shows a viable uterine pregnancy with an estimated gestational age of 6 weeks. You plan to have her follow up with her obstetric provider and prescribe vitamin supplementation. What is the next step in management?

## Choices:

1. Increase the dose of methimazole
2. Maintain the current dose of methimazole
3. Decrease the dose of methimazole
4. Switch methimazole to propylthiouracil

## Answer: 4 - Switch methimazole to propylthiouracil

## Explanations:

- Although methimazole usually is preferred for the management of hyperthyroidism due to a relatively favorable adverse effect profile, methimazole should not be used in pregnant patients. Methimazole has been associated with an increased risk of congenital malformation.
- Propylthiouracil is the therapeutic option preferred in the management of hyperthyroidism in pregnant women.
- Abnormalities in serum thyroid hormone levels in a pregnant patient should be strictly monitored. Overtreatment of hyperthyroidism in a pregnant woman can lead to congenital hypothyroidism in the developing fetus.
- Thyroid stimulating hormone monitoring in pregnant women may not be entirely accurate due to increased estrogen affecting thyroxine-binding globulin levels. This ultimately affects total T4 levels.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hyperthyroidism

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## Question 5:

A medical student is participating in research on the study of bone metabolism. He compares the serum studies and bone biopsy findings of two different cohorts of women, one group is composed of healthy women aged 25-30 years, and the other is composed of women aged 55-60 years. Which of the following processes is most likely decreased in the group of younger women compared to older women?

## Choices:

1. Expression of RANK ligand
2. Urinary excretion of osteocalcin
3. Production of osteoprotegerin
4. Mineralization of bone

## Answer: 1 - Expression of RANK ligand

## Explanations:

- RANK is a receptor found mostly on osteoclasts. RANK ligand stimulates the RANK receptor leading to the activation of osteoclasts and thereby promoting bone resorption.
- Estrogen increases the production of osteoprotegerin which blocks the RANK receptor from being stimulated by RANK ligand.
- In postmenopausal women, there is an estrogen deficiency and thus a decreased production of osteoprotegerin and increased expression of RANK ligand.
- In premenopausal women without estrogen deficiency, there will be a decreased expression of RANK ligand compared to postmenopausal women because of increased production of osteoprotegerin.

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## Research Concepts:

### Physiology, Bone

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## Question 6: A 65-year-old obese female, non-smoker with resistant hypertension and worsening diabetes mellitus type 2, presents for clearance before getting a hernia repair, because she was found to have an adrenal tumor on a noncontrast CT of the abdomen. The adrenal tumor measures 5 cm, and it is greater than 50 Hounsfield units. The previous CT scan was done three years ago showed the same tumor was 2 cm and 20 Hounsfield units. What is the most likely diagnosis?

## Choices:

1. Benign adrenal adenoma, nonfunctioning
2. Adrenal cancer, metastatic, nonfunctioning
3. Benign adrenal adenoma with catecholamine hypersecretion
4. Adrenal cancer with cortisol hypersecretion

## Answer: 4 - Adrenal cancer with cortisol hypersecretion

## Explanations:

- Adrenal masses more than 4 cm in size with irregular margins and over 50 Hounsfield units are associated with increased likelihood of adrenal cancer.
- Benign adrenal adenomas are usually smooth, are less than 4 cm in size and are also less than 10 HU on CT scan.
- Adrenal cancer may be asymptomatic, or it may present with features of whatever excess hormone it is producing.
- Patients with suspected adrenal cancer need to undergo adrenalectomy.

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## Research Concepts:

### Adrenal Adenoma

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## Question 7: After a meal, the body releases insulin to signal that you are in a ‘fed’ state. Through what mechanism of regulation does insulin inhibit pyruvate dehydrogenase complex activity?

## Choices:

1. Covalent modification
2. Transcriptional regulation
3. Allosteric regulation
4. Direct substrate regulation

## Answer: 3 - Allosteric regulation

## Explanations:

- Insulin is released from the beta-cells of the pancreas when the body is in a fed state.
- Insulin release results in the activation and subsequent autophosphorylation of a transmembrane receptor in the tyrosine kinase receptor (TKR) family.
- The TKR's autophosphorylation allows for the binding of insulin receptor substrate (IRS-1), leading to the eventual activation of the G protein, Ras.
- The activation of Ras leads to a signal cascade and the activation of MAPK--a kinase that phosphorylates Elk1 (a nuclear transcription factor for the PDC complex).

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## Research Concepts:

### Biochemistry, Citric Acid Cycle

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## Question 8: A 2-day old baby boy is brought to the office by his parents after he is found to have failed the newborn screen for a normal TSH and a low T4. Which of the following lab results would suggest a diagnosis of thyroxine-binding globulin deficiency?

## Choices:

1. Low free T4
2. Normal free T4
3. Low T3
4. High free T4

## Answer: 2 - Normal free T4

## Explanations:

- The patient may have failed the newborn screen since the cut off is usually determined by either the TSH level or the total T4. This may be one of the ways in which TBG deficiency is initially picked up.
- TBG deficiency can be highly suspected if the free T4 is normal while the total T4 is low.
- A decrease in TBG may cause an increase initially in free T4, which then negatively inhibits TSH. This causes a decrease in total T4 while free T4 stays stable in serum and thus does not have any metabolic consequences.
- A normal free T4 with a decreased total T4 and normal TSH is suggestive of TBG deficiency.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Thyroxine-Binding Globulin Deficiency

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 9: A 76-year-old male with a history of congestive heart failure, coronary heart disease, and type 2 diabetes mellitus is prescribed empagliflozin. The patient's current medications include metformin, furosemide, aspirin, atorvastatin, carvedilol, and losartan. What should the prescriber be aware of when adding empagliflozin to his current medications?

## Choices:

1. Increased risk of hypotension
2. Increased risk of hypoglycemia
3. Increased risk of hepatitis
4. Increased risk of pancreatitis

## Answer: 1 - Increased risk of hypotension

## Explanations:

- Higher incidence of adverse reactions related to volume depletion and reduced renal function are found more often in geriatric patients.
- Patients starting an SGLT2 inhibitor, such as empagliflozin, should be carefully monitored for hypotension if they are co-prescribed diuretics.
- Hypoglycemia risk is increased with concomitant use of insulin or insulin secretagogue drugs such as sulfonylureas. Empagliflozin may be used in patients with hepatic impairment.
- Empagliflozin is contraindicated in patients with severe renal impairment, which is defined as a glomerular filtration rate (GFR) less than 30/mL/min/1.73m2.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Empagliflozin

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## Question 10: A 22-year-old female with a medical history of cystic fibrosis presents for a routine visit. Her annual 2-hour 75-gram oral glucose tolerance test showed a plasma blood level of 220 mg/dL. Additional testing revealed a fasting plasma glucose of 190 mg/dL and a hemoglobin A1c level of 7.5%. She receives education and counseling regarding her new diagnosis. Her clinician informs her that insulin is the best therapy to reduce associated comorbidities with this condition. What is the most common complication if this patient is left untreated?

## Choices:

1. Neuropathy
2. Retinopathy
3. Coronary artery disease
4. Cerebral vascular accident

## Answer: 1 - Neuropathy

## Explanations:

- Microvascular complications are the most common finding in individuals with cystic fibrosis-related diabetes. Complications rarely present in individuals with CFRD and fasting hyperglycemia for less than 10 years.
- A study series by Schwarzenberg et al. looked at 285 individuals with CFRD with fasting hyperglycemia for 10 years. They reported neuropathy in 55% of subjects, gastropathy in 50% of subjects, retinopathy in 16% of subjects, and microalbuminuria in 14% of subjects.
- No microvascular complications have not been reported in CFRD individuals that do not experience fasting hyperglycemia.
- Macrovascular complications are commonly seen in type 1 and type 2 diabetes; however, they are rarely seen in CFRD.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Cystic Fibrosis Related Diabetes

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## Question 11: A young male presents to the clinic with failure to achieve puberty, cleft lip and an impaired sense of smell since childhood. He has one testis and paucity of pubic hair. Which of the following drugs would have to be started in this patient to avoid the development of a commonly associated complication of this disease?

## Choices:

1. Vitamin D and bisphosphonates
2. Vitamin E and retinoids
3. Calcimimetics and calcilytics
4. Estradiol and norgestrel

## Answer: 1 - Vitamin D and bisphosphonates

## Explanations:

- Sex hormones play a critical role in the development of heart structure and mass.
- Later in life, Osteoporosis can result from the deficiency of sex hormones.
- Sex hormones regulate the level of calcium in the blood.
- Calcium levels in the blood affect the parathyroid gland. Low calcium is a stimulus for the release of parathormone which tends to increase calcium levels in the blood by causing bone resorption.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Kallmann Syndrome

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## Question 12: A 45-year-old patient with diabetes mellitus presents complaining of chills, fevers, and malaise for 1 day. A chest x-ray reveals a large mass. CT shows pleural effusion, consolidation, a nodule, and ground-glass opacities. During exploration, a dimorphic fungal organism is seen adjacent to thrombosed vessels. Which of the following is the treatment of choice?

## Choices:

1. Posaconazole and surgery
2. Limited resection
3. Intravenous amphotericin for 6 weeks followed by thoracotomy
4. Amphotericin B and radical debridement

## Answer: 4 - Amphotericin B and radical debridement

## Explanations:

- Mucormycosis is a lethal infection and can erode into all tissue planes. It is a rare infection usually involving the rhinocerebral sinuses.
- Risk factors for developing mucormycosis are diabetes mellitus and immunosuppression including patients undergoing chemotherapy or with leukemia.
- The organism causes necrosis and is found adjacent to thrombosed blood vessels. These patients need immediate surgery with radical debridement.
- The immune function should be reconstituted, for example, recovery of neutropenia, reversal acidosis.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Mucormycosis

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## Question 13: A 43-year-old female with diabetes who was recently started on a new oral antidiabetic medication two months ago presents to the emergency department with a chief complaint of abdominal pain, nausea, and vomiting. Labs revealed normal bicarbonate, normal serum creatinine, elevated lipase, and normal beta-hydroxybutyrate. Which of the most accurately identifies the most likely diagnosis and the offending agent?

## Choices:

1. Diabetic ketoacidosis, linagliptin
2. Acute pancreatitis, metformin
3. Diabetic ketoacidosis, exenatide
4. Acute pancreatitis, sitagliptin

## Answer: 4 - Acute pancreatitis, sitagliptin

## Explanations:

- The patient has acute pancreatitis given elevated lipase, normal beta-hydroxybutyrate. It is an adverse effect reported in the post-marketing use of gliptins such as sitagliptin, alogliptin, saxagliptin.
- The FDA approved patient labeling warrants that patients should be enquired of risk factors for pancreatitis such as a history of pancreatitis, alcoholism, gall stones prior to initiating saxagliptin.
- FDA labeling also recommends providers to instruct patient regarding symptoms of acute pancreatitis such as severe persistent abdominal pain, sometimes radiating to back, with or without nausea or vomiting. They should also be instructed to immediately stop the DPP-4 inhibitors on noticing the symptoms above.
- Gliptins are oral agents which inhibit enzyme DPP-4, in turn, prolonging the half-life of GLP-1, GIP which promotes the release of insulin and reduces hyperglycemia. They have minimal adverse effects, weight neutral and less likely to cause hypoglycemia by themselves.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Dipeptidyl Peptidase IV (DPP IV) Inhibitors

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## Question 14:

A 30-year-old female goes to her primary care for a routine evaluation. She has type 1 diabetes mellitus and takes insulin glargine and insulin lispro for last 3 years. 5 days ago, she took part in a local marathon race. On physical examination, temperature is 98.5 F, blood pressure is 126/78 mm Hg, pulse rate is 78/min, and respiration rate is 16/min. Her BMI is 24 kg/m2. Laboratory studies: Hemoglobin A1c-6.8%, Urinalysis-Normal and Urine albumin-creatinine ratio-100 mg/g. In addition to refraining from heavy exercise, which of the following is the most appropriate next step in this patient's management?

## Choices:

1. Begin an angiotensin receptor blocker (ARB)
2. Perform kidney biopsy
3. Repeat urine albumin-creatinine ratio in 1 year
4. Repeat urine albumin-creatinine ratio in 2 weeks

## Answer: 4 - Repeat urine albumin-creatinine ratio in 2 weeks

## Explanations:

- Microalbuminuria is the first detectable manifestation of diabetic nephropathy and typically occurs 5 to 15 years after the diagnosis of type 1 diabetes mellitus. ACE inhibitor or ARB are not indicated as microalbuminuria is not confirmed yet.
- Kidney biopsy is not indicated unless the presence of proteinuria has been established.
- Annual measurement of the urine albumin excretion is indicated for patients with type 1 diabetes mellitus. In our patient albumin excretion is abnormal due to her participation in a marathon.
- Fever and exercise may cause a transient increase in protein excretion, and this patient's participation in a marathon explain her proteinuria. Repeat urinalyses will confirm the microalbuminuria if two of the three urine samples are positive. Therefore, in this patient, repeat urinalysis in 2 weeks is reasonable.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Diabetes Mellitus And Exercise

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## Question 15: A 4-year-old female presents to the clinic for short stature. Her physical exam is significant for webbed neck, high arched palate, and a low hairline. She had also been referred to cardiology once for a murmur found on physical exam. Her vitals are within normal limits, and she has no symptoms. Thyroid function tests are performed, but no need for any treatment is found based on the results. Which of the following lab results are consistent with the diagnosis?

## Choices:

1. Low free T4, normal TSH, high total T4
2. Normal free T4, normal TSH, low total T4
3. High free T4, high TSH, normal total T4
4. Low free T4, low TSH, low T4

## Answer: 2 - Normal free T4, normal TSH, low total T4

## Explanations:

- Based on this patient's physical exam, she has Turner syndrome which can sometimes be associated with thyroxine-binding globulin (TBG) deficiency as it is an X-linked condition.
- Turner syndrome patients have only an X chromosome, so if they have a mutation in the gene responsible for TBG, they will present with complete TBG deficiency.
- Since the stem states that no treatment is needed, it is most likely that this patient has TBG deficiency.
- TBG deficiency is characterized by normal TSH and free T4 but total T4 is low.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Thyroxine-Binding Globulin Deficiency

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## Question 16:

A 63-year-old veteran with diabetes mellitus, hypertension, hyperlipidemia, coronary artery disease, peripheral vascular disease, chronic obstructive pulmonary disease, chronic kidney disease stage 3, obesity, and poor medical compliance comes to the office for pain. He describes his pain as electric pins and needles, most noticeable in his distal extremities, especially his feet at night. He states that sometimes even just his socks would give him 9/10 sharp pain. This has made it hard for him to ambulate and attend to his daily needs, which has been making him feel depressed, with increased weight gain and difficulty in sleeping. He admits he does not take his medications sometimes for a week at a time. He only takes metformin, aspirin, lisinopril, acetaminophen and occasionally albuterol. He has refused other medications that have been recommended in the past due to inconvenience or perceived side effects. His blood pressure of 168/114 mmHg, the remainder are normal. Physical exam of his feet shows no skin breakage or other signs of infection. His sensation to monofilament is diminished on the soles of his feet, but he responds with a pronounced pain reaction when you test his toes and the dorsal portion of his feet. Routine lab work shows a hemoglobin A1C of 11.7%. What would be the best mechanism of action of the best medication for his symptoms?

## Choices:

1. Blocking sodium channels
2. Blocking calcium channels
3. Blocking the serotonin and norepinephrine reuptake system
4. Binding to GABA receptors to increase the effect of GABA

## Answer: 2 - Blocking calcium channels

## Explanations:

- Roughly 10% of people in the U.S. have diabetes melllitus and this rate is increasing by about 5% each year. At least 10% and some sources estimate 100% of people who have diabetes will develop neuropathic pain.
- Current ADA recommendations for diabetic neuropathy suggest pregabalin (a calcium channel blocker) or duloxetine, a serotonin and norepinephrine reuptake inhibitor (SNRI), as first-line agents to treat painful diabetic neuropathy, which includes allodynia. This correlates with the IASP guidelines that recommend tricyclic antidepressants, selective serotonin reuptake inhibitors, pregabalin, and gabapentin as first-line agents for general neuropathic pain.
- While an SNRI is a first line option for diabetic neuropathy, this patient has several contraindications to starting its use. He has uncontrolled hypertension, coronary artery disease, and a history of medical noncompliance, which correlates with his Hgb A1C of 11.7%. SNRI's increase norepinephrine and can worsen hypertension and vascular issues. SNRI's also can result in discontinuation syndrome when a patient stops them abruptly, which this patient is at risk of doing.
- Allodynia is a symptom when a nonpainful sensation elicits a painful response. It is a type of neuropathic pain. It is different than hyperalgesia, which is when a painful sensation elicits an exaggerated pain response, although both often will occur together. Diabetic neuropathy is one cause of allodynia, but many other diseases can also cause allodynia.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Allodynia

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## Question 17:

A 65-year old female, with a past medical history of type 2 diabetes mellitus, hypertension, and dyslipidemia. Her medications include subcutaneous insulin glargine 20 units in the morning, subcutaneous insulin lispro 6 units three times a day with meals, and oral atorvastatin 40 mg at bedtime. She visits your pre-operative clinic for evaluation before elective hysterectomy scheduled next week. She denies episodes of hypoglycemia or hypoglycemic unawareness. Her hemoglobin A1c is 6.8%. What changes in her insulin regimen should be recommended prior to the surgery?

## Choices:

1. No change in the insulin regimen
2. Hold insulin lispro and take 16 units of insulin glargine on the day of surgery
3. Hold insulin lispro and take 16 units of insulin glargine on the day of surgery and the day prior
4. Hold insulin glargine and take 4 units of insulin lispro three times a day on the day of surgery

## Answer: 2 - Hold insulin lispro and take 16 units of insulin glargine on the day of surgery

## Explanations:

- Mealtime insulin consists of rapid or short-acting insulin which exerts a peak effect between 1.5 to 3 hours and in the absence of nutritional intake, can result in life-threatening episodes of hypoglycemia. Although long-acting basal insulin does not have a peak effect, to avoid hypoglycemia during prolonged fasting, it is recommended to reduce the dose by 20-25% the evening before surgery if routinely taken at bedtime and on the day of surgery if regularly taken in the morning or dosed twice daily. The dose of basal insulin should be reduced by 25-50% in patients who receive an inappropriately high dose of basal insulin(>60% of the total daily dose of insulin), who have a total daily dose of insulin >100 units, have brittle diabetes or frequent episodes of hypoglycemia.
- In the case discussed above, the patients total daily dose of insulin is 38 units, approximately 50% of which she takes as long-acting basal insulin and the remaining as rapid-acting nutritional insulin with meals. She denies any episodes of hypoglycemia and her hemoglobin A1C reflects optimal glycemic control. The best recommendation for the patient is to hold nutritional insulin and reduce basal insulin by 20-25% (approximately 16 units) on the day of surgery.
- In this case, it is unnecessary to reduce long-acting insulin the day before surgery as she routinely takes her basal insulin in the morning and will not be in fasting state. This can predispose her to unwanted hyperglycemia.
- Holding basal insulin and continuation of nutritional insulin while in a fasting state can predispose her to fluctuating episodes of hypoglycemia and hyperglycemia.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Diabetic Perioperative Management

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## Question 18:

A 35-year-old woman with no significant past medical history presents for the evaluation of a pituitary mass found incidentally on MRI brain imaging done after a recent motor vehicle collision. The pituitary mass is described as 1.1 x 0.9 x 0.9 cm, homogeneous enlargement of the pituitary without compression of the optic chiasm. The patient has no complaints. Medications include calcium and vitamin D as she is breastfeeding. She delivered a healthy baby three months ago. Lab work reveals normal TSH of 2.2 microU/ml, free T4 0.9 ng/dl, and prolactin 89 ng/ml. Other pituitary hormones are within normal limits. What is the most likely diagnosis?

## Choices:

1. Prolactinoma
2. Nonfunctioning macroadenoma
3. Pituitary hyperplasia
4. TSH-secreting adenoma

## Answer: 3 - Pituitary hyperplasia

## Explanations:

- Pituitary hyperplasia on MRI brain appears as a homogeneous enlargement of the gland.
- Pituitary hyperplasia can be a normal response to physiological stimulation during adolescence, pregnancy, and lactation or as a pathological condition.
- During pregnancy and lactation, striking hypertrophy of the pituitary can occur. The gland commonly reaches a height of 10 mm by the third trimester and obtains maximal height of 12 mm in the first postpartum week.
- Pregnancy and lactation cause a physiologic elevation in prolactin. In prolactinoma, prolactin levels are usually more than 200 ng/ml.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Pituitary Hyperplasia In Primary Hypothyroidism

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## Question 19: Which one of the following is expected in Kallmann syndrome?

## Choices:

1. Constitutional delay of puberty
2. Hypergonadotropic hypogonadism
3. Hypogonadotropic hypogonadism
4. Precocious puberty

## Answer: 3 - Hypogonadotropic hypogonadism

## Explanations:

- Gonadotrophin-releasing hormone (GnRH) deficiency leads to hypogonadotropic hypogonadism in Kallmann syndrome.
- Anosmia is another feature of this disorder.
- Other than the loss of the sense of smell, there is no difference between Kallmann syndrome and hypogonadotropic hypogonadism.
- The underlying cause of the failure to produce luteinizing hormone and follicle stimulating hormone by the pituitary is impairment of the hypothalamus production and release of GnRH.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Kallmann Syndrome

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## Question 20:

A 12-year-old boy presents to his provider for a routine check-up. His mother states that he is not gaining weight and is short heightened than his peers in school. He urinates frequently and cannot play much with his friends because of muscle weakness. Physical examination shows height less than the 50th percentile for his age group and weight less than the 65th percentile. Laboratory analysis showed hyperchloremic metabolic acidosis, serum potassium of 2.5 meq/L. Urinalysis showed urine pH of 4.5, positive urine anion gap, urine sodium 30 meq/L, aminoaciduria, and glycosuria. Which one of the following is the cause of stunted growth in this child?

## Choices:

1. Chronic malabsorption syndrome
2. Type 1 distal renal tubular acidosis (RTA)
3. Type 2 proximal RTA
4. Diuretic abuse

## Answer: 3 - Type 2 proximal RTA

## Explanations:

- Type 2 proximal RTA presents with hypokalemia, growth failure, hypophosphatemic rickets, and hyperchloremic metabolic acidosis.
- Fanconi syndrome is a defect in PCT causing failure to reabsorb almost all amino acids, glucose, bicarbonate, phosphate, and potassium.
- The most common cause of proximal RTA with or without Fanconi syndrome in adults is the excretion of monoclonal light chains. Thus, monoclonal gammopathy should be excluded in all adults with proximal RTA unless another cause is apparent.
- Patients with proximal RTA should be evaluated for Fanconi syndrome with serum and urine measurements looking for renal glycosuria, hypophosphatemia, and hypouricemia.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Renal Tubular Acidosis

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## Question 21: A 50-year-old postmenopausal female is being placed on a regimen of estrogen hormone replacement therapy and calcitonin for osteoporosis prophylaxis. She also has been instructed to initiate weight-bearing exercise as an adjunct. Which of the following is true about this treatment plan?

## Choices:

1. It is designed to increase serum blood calcium levels, so it is more available to prevent osteoporosis
2. It has a goal of increasing calcium in the bone matrix
3. Exercise has no real effect on the osteoporosis aspect of her case. It is strictly for overall health benefit and weight loss
4. This regimen also protects against malignancies

## Answer: 2 - It has a goal of increasing calcium in the bone matrix

## Explanations:

- Calcitonin reduces serum calcium and inhibits osteoclastic activity.
- Weight-bearing exercise also is helpful. According to Wolff's law, bone remodels in response to imposed stress.
- Other lifestyle modifications include smoking and alcohol cessation.
- There is a malignancy risk with calcitonin. In 2013, the Federal Drug Administration voted against using it as a first-line therapy for osteoporosis largely based on that risk.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Osteoporosis

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## Question 22: A 65-year-old female with a history of Hashimoto thyroiditis presented with worsening dyspnea. Examination revealed a significantly enlarged thyroid gland compared to the last office visit two months ago which is firm and fixed to the surrounding structures. Diffuse large B-cell lymphoma (DLBCL) confined only to the thyroid gland, stage I E is diagnosed after all the appropriate investigations. What is the most appropriate therapy?

## Choices:

1. Surgery
2. Chemotherapy
3. Radiation therapy
4. Combined chemoradiation therapy

## Answer: 4 - Combined chemoradiation therapy

## Explanations:

- Combined modality treatment (CMT) with chemotherapy and radiotherapy is preferred for the limited stage (I E and II E) diffuse large B-cell thyroid lymphoma. Chemotherapy regimen used is rituximab- cyclophosphamide, doxorubicin, vincristine, prednisolone (R-CHOP).
- CMT is associated with a higher five-year failure-free survival rate of 91 percent compared to 50 percent with chemotherapy alone.
- Advanced stage (III E and IV) DLBCL cannot be treated with one irradiation field; hence chemotherapy alone is used in such cases.
- Surgery is not recommended except for diagnostic biopsy due to the potential surgical risks and no additional benefit compared to chemoradiation therapy. Obstructive symptoms like dyspnea usually improve within hours of chemotherapy (R- CHOP) initiation due to the steroid (prednisolone) in the regimen.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Thyroid Lymphoma

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## Question 23: A patient reports that she has lost 20 pounds (9 kg) over the past month by following a very low carbohydrate diet with less than 50 mg of carbohydrates daily. Limited bread, pasta, or potatoes are allowed, but meat, seafood, and vegetables can be included, ad libitum until satiated. Which of the following is true about this diet?

## Choices:

1. If combined with behavioral modification, weight loss after two years is the same as with a low-fat diet
2. The patient's HDL is likely to decrease
3. There is a significant risk for kidney failure with a low carbohydrate, high protein diet
4. There is proven risk reduction for mortality and cardiovascular disease

## Answer: 1 - If combined with behavioral modification, weight loss after two years is the same as with a low-fat diet

## Explanations:

- The low-carbohydrate diet was found to promote rapid weight loss but most studies found similar weight loss after 2 years.
- Patients on low-carbohydrate diets usually have increased HDL.
- In patients without kidney disease, there are no studies that demonstrate risk for kidney failure on a low carbohydrate diet.
- There are no long-term, randomized studies that demonstrate a reduction in mortality or major cardiovascular events.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Low Carbohydrate Diet

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## Question 24:

A 52-year-old woman presents to the hospital with chronic diarrhea and vague upper abdominal pain. She has a history of diabetes mellitus 2 and hypertension. CT of her abdomen shows a 3 cm x 2 cm mass in the head of the pancreas. An endoscopic retrograde cholangiopancreatography with biopsy is performed, and the histopathology revealed grade 1 differentiation, and immunohistochemistry is positive for somatostatin, neuron-specific enolase, and vasoactive intestinal polypeptide. PET scan is negative for metastasis. Which of the following is the best initial therapy for this patient?

## Choices:

1. Etoposide
2. Octreotide
3. Cisplatin
4. Everolimus

## Answer: 2 - Octreotide

## Explanations:

- The presence of diabetes mellitus and diarrhea in the setting of somatostatin positive tumor gives the diagnosis of functional/ secretory somatostatinoma. Somatostatin analogs are one of the first-line medical therapy in functional somatostatinoma.
- Somatostatin analogs function by inhibiting cellular proliferation and mediating apoptosis by binding to the somatostatin receptors. They also exert indirect anti-proliferative mechanisms include inhibition of circulating growth factors such as vascular endothelial growth factor.
- WHO has classified gastro-entero-pancreatic tumors based on the mitotic index into grade 1 – Ki-67 =2%, grade 2 – Ki-67 3%–20%, grade 3 – Ki-67 >20%, mixed adenocarcinoma, and neuroendocrine carcinoma. Low-grade tumors generally do not respond to platinum-based therapy. However, they have proven efficacy in advanced grade tumors in conjunction with etoposide/irinotecan.
- Everolimus, mammalian target of rapamycin (mTOR) inhibitor is effective in patients with refractory, functional neuroendocrine tumors. Currently, it is not recognized as first-line therapy.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Somatostatinoma

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## Question 25: A 45-year-old female with severe anxiety and tremors is found to have a loud bruit over the eye. What is the organ system that may be responsible for her findings?

## Choices:

1. Liver
2. Brain
3. Kidney
4. Thyroid

## Answer: 4 - Thyroid

## Explanations:

- Riesman sign is the finding of a bruit over the eye. It sometimes is heard in patients with severe Graves disease.
- Graves disease frequently results in hyperthyroidism, which leads to a variety of symptoms such as severe anxiety and tremors.
- Graves' ophthalmopathy, goiter, and pretibial myxedema are the main symptoms of Graves disease that are not associated with hyperthyroidism. They are caused by the autoimmune processes of the disease.
- The thyroid-stimulating hormone receptor is located in orbital fat and connective tissue and is the main target of the autoimmune antibodies. Lymphocytes, plasmocytes, and mastocytes infiltrate the orbital connective tissue, leading to inflammation that results in deposition of collagen and glycosaminoglycans in the muscles. Subsequently, this leads to enlargement and fibrosis. Also, there is an induction of lipogenesis by fibroblasts and preadipocytes. This causes enlargement of the orbital fat and extra-ocular muscle compartments.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Graves Disease

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## Question 26: A 55-year-old female is found to have low hemoglobin and macrocytic hyperchromic anemia during a routine check-up. Further investigations, including gastroscopy and gastric mucosal biopsies, confirm the presence of atrophic gastritis, achlorhydria, raised fasting gastrin, and absent H. pylori antibodies. Which of the following test results is associated with the highest gastric cancer risk?

## Choices:

1. Elevated pepsinogen-1/pepsinogen-2 ratio
2. Decreased pepsinogen-1
3. Normal iron studies
4. Elevated serum zinc concentration

## Answer: 2 - Decreased pepsinogen-1

## Explanations:

- The patient has atrophic autoimmune gastritis in the presence of absent H. pylori antibodies, raised serum gastrin, and achlorhydria. Low level of pepsinogen 1, low pepsinogen-1/pepsinogen-2 ratio, together with high fasting gastrin increase the gastric cancer risk irrespective of the status of H. pylori infection.
- In patients with atrophic autoimmune gastritis, pepsinogen-1 is low; a decreased pepsinogen-1 is a risk factor for gastric cancer development.
- Patients with atrophic autoimmune gastritis usually have early iron-deficiency anemia. Iron deficiency is also seen in advanced disease. Achlorhydria and raised gastrin contribute to the pathogenesis of iron deficiency.
- Patients with atrophic autoimmune gastritis usually have associated failures in the absorption of vitamin B12, iron, calcium, magnesium, and zinc.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Gastritis

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## Question 27:

A 4-year-old girl presents to the office for evaluation of pubic hair. She developed pubic hair and body odor four months ago. There is no breast enlargement. The family denies any exposure to exogenous steroids. Physical examination reveals no breast enlargement and sexual maturity rating (SMR) 3 pubic hair. The child's parents are concerned that she appears older than her age, and her shoe size has increased twice in the last six months. Bone studies reveal a skeletal maturation of 8 years at the chronological age of 4. Which of the following lab results is most likely to be abnormal in this patient?

## Choices:

1. Prolactin
2. Growth hormone
3. 17-hydroxyprogesterone
4. Follicle-stimulating hormone

## Answer: 3 - 17-hydroxyprogesterone

## Explanations:

- The child has signs of secondary sexual characteristics, such as pubic hair development and body odor in the absence of breast development. Based on the presentation and bone age, the likely cause of her peripheral precocious puberty is congenital adrenal hyperplasia (CAH).
- Classic forms of the disease in females usually present with ambiguous genitalia. The nonclassic form presents later with precocious puberty. Excess androgens lead to linear growth acceleration due to conversion to estradiol. This explains the advanced bone age in this patient.
- CAH is due to 21 hydroxy deficiency and there will be a marked elevation of 17 hydroxyprogesterone levels.
- Prolactin, growth hormone, and FSH are not useful in the diagnosis of CAH.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Precocious Puberty

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## Question 28:

A 45-year-old woman with no known past medical history comes in for an evaluation of a 4-week history of progressively worsening dyspnea, palpitations, and swelling of the legs. She has diarrhea and an unintentional weight loss of 2.3 kg (5 lb). On physical examination, she is afebrile, blood pressure is 89/60 mmHg, pulse rate is 115/min, respiratory rate is 22/min, and oxygen saturation of 92% on room air. There is jugular venous distention extending to the jaw. The thyroid gland is palpable without any identifiable nodules. A hyperdynamic precordium with an S3 is heard on the cardiac exam. She has 2+ edema of bilateral lower extremity extending to the knee. The white cell count is 5,000/microL (5.0 × 10^9/L) with a normal differential. Results of the basic metabolic panel are normal. An electrocardiogram shows sinus tachycardia. An echocardiogram reveals a left ventricular ejection fraction of 10% without any valvular regurgitation. A chest x-ray shows pulmonary vascular congestion. Which of the following is the most appropriate next test to perform for this patient?

## Choices:

1. Antinuclear antibody level
2. Endomyocardial biopsy
3. Thyroid studies
4. Viral titers

## Answer: 3 - Thyroid studies

## Explanations:

- This patient is exhibiting signs and symptoms suggestive of hyperthyroidism. She also has pulmonary edema secondary to acute heart failure.
- Hyperthyroidism is a reversible cause of heart failure hence all patients with new-onset heart failure must be considered for an evaluation for thyroid dysfunction.
- It is caused due to the overstimulation of the heart due to excess thyroid hormone, which resembles sympathetic stimulation.
- Endomyocardial biopsy is rarely recommended due to its invasive nature of testing. Viral titers are useful in the diagnosis of the responsible pathogen but do not have any utility in the treatment of pulmonary edema and heart failure.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Pulmonary Edema

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## Question 29: A 49-year-old female with a past medical history significant for hypothyroidism and insomnia comes to the clinic complaining of difficulty falling asleep at night. She has been compliant with her levothyroxine medication, and her last TSH was 3.4 mU/L. Vitals are within normal limits. She has heard from a friend that pentobarbital can be used to treat her symptoms. If phenobarbital is prescribed, what is the most appropriate step to prevent any adverse effects from a mediation interaction in this patient?

## Choices:

1. Increase her levothyroxine dose
2. Decrease her levothyroxine dose
3. Discontinue the levothyroxine
4. No change to her medications

## Answer: 1 - Increase her levothyroxine dose

## Explanations:

- Pentobarbital is a hepatic enzyme inducer and can affect the metabolism of other drugs through the same hepatic enzymes. This increases the metabolism of many drugs, thus reducing their therapeutic effect.
- Thyroid hormone metabolites T4 and T3 are metabolized in the liver through deiodination, glucuronidation, and sulfation. Barbiturates such as pentobarbital function to increase the activity of the hepatic enzymes and ultimately increase hormone clearance.
- Many drugs are metabolized through hepatic enzymes, and it is important to be familiar with their interactions. Drugs can be inducers or inhibitors of the hepatic enzymes and can either increase or decrease their metabolism. Among the drugs with which pentobarbital is known to interact include warfarin, corticosteroids, doxycycline, and hormones such as estrogen and progesterone, to name a few.
- Decreasing or failing to change the dose would only further exacerbate her hypothyroidism. Discontinuing the medication is not necessary as the only interaction these medications are known to have is to manipulate the rate at which levothyroxine is metabolized.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Pentobarbital

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## Question 30: A 17-year-old male presents for a checkup. He is relatively tall for his age with sparse body hair, small genitalia, somewhat reduced muscle mass, late puberty, and gynecomastia. Which is true about the epidemiology of the patient's disorder?

## Choices:

1. It occurs in 1:10,000 to 1:25,000 males
2. The incidence of the disorder is increasing
3. Most cases of the disorder in the United States are diagnosed at or before birth
4. Most males with the disorder will not be azoospermic

## Answer: 2 - The incidence of the disorder is increasing

## Explanations:

- Klinefelter syndrome is the most common sex chromosome aneuploid disorder with a frequency of 1:500 to 1:1,000 males. The majority of cases of Klinefelter syndrome are due to random events during gametogenesis in parents with a typical complement of sex chromosomes.
- The incidence of Klinefelter syndrome appears to be increasing according to comparative studies of frequency over the past half-century. Hypothesized causes including increased parental age, environmental disruptors of meiosis I, and decreased frequency of termination of pregnancies in which Klinefelter syndrome is identified.
- Up to two-thirds of cases of Klinefelter syndrome are suspected of being undiagnosed. Likely less than 25% of all cases are diagnosed at or before birth, though the increase in non-invasive prenatal testing will likely increase the diagnosis of Klinefelter syndrome prenatally.
- Virtually all men with Klinefelter syndrome have impaired fertility and most will be azoospermic. Advances in assisted reproduction will allow some men with Klinefelter syndrome to father biological children but substantial technology is involved. A small minority of men with Klinefelter syndrome may produce some sperm with multiple sex chromosomes.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Klinefelter Syndrome

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## Question 31: A 35-year-old female with a history of hypothyroidism presents with fatigue, diffuse body aches and dark urine for one day. Labs show a creatinine of 2.5 mg/dL, potassium 6 mEq/L, thyroid stimulating hormone (TSH) of 14 IU/mL, CK 10,000 U/L. Urinalysis shows hemoglobinuria with a few leukocytes and no erythrocytes. What is the most likely cause of this patient's presentation?

## Choices:

1. Acute compartment syndrome
2. Rhabdomyolysis
3. Hyperkalemia
4. Encephalopathy

## Answer: 2 - Rhabdomyolysis

## Explanations:

- Rhabdomyolysis can be a presenting symptom of hypothyroid myopathy.
- Encephalopathy can occur in Hashimoto thyroiditis but not in hypothyroid myopathy.
- Some electrolyte abnormalities can occur in hypothyroid myopathy, but this presentation is typical of rhabdomyolysis.
- Acute compartment syndrome can occur in hypothyroid myopathy. The pathophysiology and presentation of acute compartment syndrome are different from rhabdomyolysis.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hypothyroid Myopathy

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## Question 32: A patient with diabetes mellitus is referred for evaluation of adding hyperbaric oxygen therapy (HBOT) to his treatment regimen for a foot wound. After evaluating the wound, tendons are exposed, but the wound does not probe to bone. There are no signs of infection, but the patient reports he has had the wound for 10 months. Does this patient meet indication requirements for HBOT?

## Choices:

1. Yes, treat with 2.4 atmospheres absolute (ATA) for 10 to 15 treatments
2. Yes, treat with 2.4 ATA for 20 to 40 treatments
3. Yes, treat with 3 ATA for 10 to 15 treatments
4. No, the patient does not meet indication requirements

## Answer: 4 - No, the patient does not meet indication requirements

## Explanations:

- This patient does not meet indication requirements.
- Although diabetic foot wounds are treated with hyperbaric oxygen therapy (HBOT), the wound must be a Wagner grade 3 or greater to meet indication requirements. Wagner grade 3 or greater diabetic foot wounds have been shown to benefit from HBOT and have lower amputation rates. A standard course of therapy would be 30 to 40 treatments at 2.4 atmospheres absolute.
- The fact that the wound has not healed in 10 months is likely that there are other factors inhibiting this patient's ability to heal. The patient has to fail 6 weeks of appropriate therapy consisting of debridement, antibiotics if indicated, and offloading in order to be a candidate for supplemental HBOT.
- A detailed history may reveal factors such as peripheral vascular disease, smoking, not properly offloading, poor diet, vitamin deficiency, uncontrolled comorbid conditions, or medication side effects.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Diabetic Foot Infections

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## Question 33: A young female is diagnosed with hypothyroidism and is prescribed levothyroxine. On follow up visit, she reports improvement in her fatigue and other accompanying symptoms. Her primary care provider advises following up with a gastrointestinal specialist in the long run. What complication of her disease would be most appropriately addressed by the specialist?

## Choices:

1. Weight gain
2. Hepatic dysfunction
3. Achlorhydria
4. Dysphagia

## Answer: 3 - Achlorhydria

## Explanations:

- Thyroid hormone plays a role in hydrochloric acid secretion; hence, hypothyroidism can lead to achlorhydria.
- Patients who have achlorhydria have a small risk of developing gastric adenocarcinoma and gastric carcinoid tumor.
- There is no specific treatment for achlorhydria. The main target is to treat the underlying cause and improve the complications of achlorhydria.
- Majority of the complications found in achlorhydria are due to nutrient deficiency.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Achlorhydria

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## Question 34:

A 65-year-old male patient presented with a one-month history of swelling in the midline of the neck which was associated with pain, dysphagia, and hoarseness of voice. Physical examination showed an enlarged thyroid gland and bilateral neck lymph nodes. Ultrasonography revealed an ill-defined large hypoechoic mass in the left lobe of thyroid. Fine needle aspiration cytology was performed. The smears showed neoplastic cells arranged in loose clusters as well as dispersed singly in the necrotic background. The individual cells showed identifiable malignant cytologic features including large, pleomorphic nuclei with irregular nuclear membranes, coarse chromatin, prominent nucleoli, and several mitotic figures. What is the most likely diagnosis?

## Choices:

1. Papillary thyroid carcinoma
2. Follicular carcinoma
3. Medullary carcinoma
4. Anaplastic thyroid carcinoma

## Answer: 4 - Anaplastic thyroid carcinoma

## Explanations:

- The diagnosis of anaplastic thyroid carcinoma is most commonly suspected on ultrasonography and clinical examination. The first diagnostic modalities in the evaluation of anaplastic thyroid carcinoma are ultrasonography and fine needle aspiration biopsy.
- Cytologic findings of anaplastic thyroid carcinoma include (1) biphasic population tumor and uninvolved thyroid, (2) highly cellular with single cells and focal clusters composed of remarkable atypical cells, (3) mitotic figures are prominent, and (4) background necrosis and inflammatory cells may be seen.
- In previous reports, the cytological diagnosis accuracy of anaplastic thyroid carcinoma was 78.7% to 90%.
- Fine-needle biopsy is a useful diagnostic modality for anaplastic thyroid carcinoma. However, the diagnosis of anaplastic thyroid carcinoma must be established by surgical biopsy or at surgery.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Anaplastic Thyroid Cancer

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## Question 35:

A 66-year-old female presents to the office for a follow-up examination. She has a past medical history of type 2 diabetes mellitus, hypertension, hyperlipidemia, which are medically managed with amlodipine, metformin, glipizide, and atorvastatin. She is prescribed calcium, vitamin D, and a drug that can be used for the prevention of osteoporosis in postmenopausal women. The provider describes the drug has an estrogen-agonistic effect on the bone, thereby increasing bone mass and mineralization. Which of the following the most likely adverse effect of the new drug?

## Choices:

1. Increased deep vein thrombosis risk
2. Increased breast cancer risk
3. Increased mesothelioma risk
4. Increased hepatocellular carcinoma risk

## Answer: 1 - Increased deep vein thrombosis risk

## Explanations:

- Raloxifene is an FDA approved second-generation selective estrogen receptor modulator (SERM), a drug with an estrogen-agonistic effect on bone, thereby increasing bone mineral density and mass by decreasing bone resorption. It also has an estrogen-antagonistic effect in the uterus and breast- in contrast with tamoxifen (a first generation selective estrogen receptor modulator), which has an estrogen-agonistic effect over the uterus.
- Raloxifene modifies markers of cardiovascular risk, by decreasing LDL-C, fibrinogen, lipoprotein A and by increasing HDL2-C, without modifying triglycerides levels.
- Most common documented adverse effects of raloxifene are hot flashes, flu-like symptoms, muscle spasm, arthralgia, and infection. Less common effects are insomnia, vomiting, sinusitis, deep venous thrombosis (DVT), bronchitis, pharyngitis, breast pain.
- Contraindications to raloxifene include past medical history of deep venous thrombosis, renal vein thrombosis, pulmonary embolism, malignancy, active smoking or any thrombophilia (factor V Leiden deficiency, prothrombin gene mutation G20210A, antiphospholipid syndrome, deficiency of antithrombin, protein C and S deficiency).

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Raloxifene

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## Question 36: A patient with a long history of heart disease wants a recommendation on the use of omega 3 polyunsaturated fatty acids. What are the current recommendations from the American Heart Association on this matter?

## Choices:

1. They can be used to prevent secondary atrial fibrillation
2. They can be used for secondary prevention of outcomes in congestive heart failure
3. They can be used for secondary prevention of vascular disease
4. They can be used for secondary prevention of cardiogenic shock

## Answer: 2 - They can be used for secondary prevention of outcomes in congestive heart failure

## Explanations:

- The use of polyunsaturated omega fatty acids for heart disease has been extensively studied.
- The majority of studies have looked at secondary prevention in patients with diabetes mellitus and those at high risk for heart disease.
- The latest recommendations by the American Heart Association indicate that these unsaturated omega acids can be used for secondary prevention of outcomes in congestive heart failure.
- There is little good evidence to support the use of these fatty acids for secondary prevention of atrial arrhythmias.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Omega-3 Fatty Acids

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## Question 37:

A 17-year-old white female is being treated for type 1 diabetes mellitus with diabetic ketoacidosis (DKA) secondary to infection and insulin nonadherence. The treatments provided so far include fluid therapy, insulin, and electrolyte replacement. The anion gap remains elevated at 28 mmol/L although it is trending downward with insulin therapy. The last glucose check was 136 mg/dL. The patient is otherwise stable other than mild tachycardia with a heart rate of 110/min. What is the next step in management?

## Choices:

1. Stop the insulin drip but continue the electrolyte monitoring and glucose point of care checks
2. Stop the insulin and administer bicarbonate to correct the anion gap
3. Continue the IV insulin and add dextrose
4. Continue the IV insulin with no further changes to management

## Answer: 3 - Continue the IV insulin and add dextrose

## Explanations:

- Diabetic ketoacidosis (DKA) is a complication of diabetes mellitus in which the body cannot appropriately respond to increased insulin demands brought about through stress, infection, etc. The mainstay of therapy includes significant fluid therapy to replace volume loss from osmotic diuresis, electrolyte replacement, and insulin therapy.
- Although insulin therapy is necessary to help lower blood glucose levels, it also functions to slow down ketogenesis secondary to lipolysis, thus lowering the anion gap. Administering bicarbonate would be temporary and not correct the underlying metabolic derangement.
- Insulin therapy in DKA is to help lower the elevated anion gap and should continue until the anion gap normalizes. In situations where the blood glucose reaches 200 mg/dL or below, and the anion gap remains elevated, one should continue the insulin drip and add IV dextrose to avoid hypoglycemia. Continued administration of insulin diminishes ketone production by reducing lipolysis and glucagon secretion and is, therefore, correcting the underlying metabolic derangement
- Continuation of the insulin would cause hypoglycemia and potential death without further intervention. A single episode of acute hyperglycemia will not kill a patient. In contrast, a single episode of acute hypoglycemia can kill a patient.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hypoglycemia

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## Question 38:

A 65-year-old man is evaluated following a post-transplant screening for diabetes mellitus. He had a kidney transplant one week ago without any complications. He also has a history of hypertension and coronary artery disease. He did not have diabetes before kidney transplant and currently is asymptomatic. His home medications are tacrolimus, mycophenolate mofetil, prednisone, aspirin, atorvastatin, and amlodipine. On physical examination, blood pressure is 127/77 mmHg, and pulse rate is 81/min. The remainder of the examination is unremarkable. His blood work shows fasting glucose of 145 mg/dL (7.1 mmol/L) and hemoglobin A1c of 5.2%. Which of the following is the next best step in the management of this patient?

## Choices:

1. Rule out diabetes and return for screening after one year
2. Repeat fasting plasma glucose in a week
3. Oral glucose tolerance test after 3 months
4. Start treatment for diabetes

## Answer: 2 - Repeat fasting plasma glucose in a week

## Explanations:

- New onset diabetes mellitus (NODAT) is a very common complication after solid organ transplantation. Transplantation centers perform the screening tests weekly in the first month and continue screening at months 5, 6 and 12 post-transplantation. After the first year, the risk of NODAT is lower, and yearly screening is recommended.
- When different results occur among different screening tests for diabetes mellitus, it is recommended to repeat the abnormal screening test.
- Transplantation centers perform the screening tests weekly in the first month and continue screening at months 5, 6 and 12 post-transplantation. After the first year, the risk of NODAT is lower, and yearly screening is recommended.
- HbA1c is not recommended for NODAT diagnosis during first 3 months after the transplantation, because red blood cell survival is reduced after transplant. Beyond 3 months the new hemoglobin has been synthesized and glycated for the appropriate period.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### New Onset Diabetes After Transplant

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## Question 39: A 16-year-old female presents with anorexia, weight loss, hyperpigmentation, bowel changes, and lightheadedness on standing. She states her symptoms are progressive and developed one month ago. The cosyntropin stimulation test shows random serum cortisol of 11 micrograms/dL. Serum cortisol 1 hour after administering 0.25 mg cosyntropin is 14 micrograms/dL. Aldosterone level is 10 ng/dL. Which of the following is an appropriate treatment option for this patient?

## Choices:

1. Hydrocortisone 15 mg daily for life
2. Prednisone 5 mg daily for life
3. Hydrocortisone 15 mg and fludrocortisone 0.1 mg daily for life
4. Prednisone 60 mg daily tapering to 10 mg a day and fludrocortisone 0.1 mg daily for life

## Answer: 3 - Hydrocortisone 15 mg and fludrocortisone 0.1 mg daily for life

## Explanations:

- The patient has primary adrenal insufficiency and requires both glucocorticoid and mineralocorticoid replacement.
- Either hydrocortisone 15 mg or prednisone 5 mg daily can be used. Mineralocorticoid replacement is with fludrocortisone 0.1 mg daily.
- Patients with adrenal insufficiency often present with hypotension, altered mental status, anorexia, vomiting, weight loss, fatigue, and recurrent abdominal pain. Salt craving and orthostatic hypotension are common in patients with primary adrenal insufficiency, due to the volume depletion from the reduced mineralocorticoid function.
- If the patient has additional stress from surgery or infection, higher doses of glucocorticoids may be needed.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Adrenal Insufficiency

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## Question 40:

A 24-year-old female with a past medical history of Graves disease is brought to the emergency room by her roommate. She is obtunded, her heart rate is 128 per minute, the temperature is 104 degrees Fahrenheit, and the respiratory rate is 34 per minute. She is dehydrated and has scleral icterus. The patient's roommate mentions that the patient was vomiting for the last two days. A pregnancy test is positive. Thyroid-stimulating hormone is 0.01, and free T3 is 20.0. Blood work shows mild leukocytosis without an obvious focus of infection. Alongside IV fluids and empiric antibiotics, how would you treat this patient?

## Choices:

1. Start Lugol's iodine followed by Propylthiouracil and Propranolol an hour later; add hydrocortisone
2. Start Lugol's iodine, add propylthiouracil and hydrocortisone an hour later; give radioiodine treatment two weeks later
3. Start propranolol and propylthiouracil followed by Lugol's iodine an hour later; add hydrocortisone
4. Start propranolol, propylthiouracil, and hydrocortisone; add Lugol's iodine an hour later; then give Radioiodine therapy two weeks later

## Answer: 3 - Start propranolol and propylthiouracil followed by Lugol's iodine an hour later; add hydrocortisone

## Explanations:

- Never give Lugol's iodine prior to propylthiouracil and beta-blockade.
- Radioiodine treatment during pregnancy is contraindicated due to risks of teratogenicity.
- Hydrocortisone can be added for treatment of thyroid storm, it is safe during pregnancy.
- For a non-pregnant person with thyroid storm, radioiodine treatment can be considered after 10-14 days of treating with thionamide, b-blockade and Lugol's iodine.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Thyroid Storm

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## Question 41: A 56-year-old female is found to have an asymptomatic thyroid nodule and is euthyroid. Fine needle biopsy shows follicles that resemble normal thyroid tissue but after excision, the tumor cells show PAX-PPAR-gamma fusion gene. What is the most probable diagnosis?

## Choices:

1. Follicular carcinoma
2. Medullary thyroid carcinoma
3. Papillary thyroid carcinoma
4. Anaplastic thyroid carcinoma

## Answer: 1 - Follicular carcinoma

## Explanations:

- Follicular carcinoma can be difficult to distinguish from follicular adenoma with fine needle biopsy.
- Forty-nine percent of follicular carcinoma show RAS point mutations, 36% show PAX-PPAR-gamma rearrangements, and only 3% show both.
- Paired box or PAX genes are associated with several cancers including PAX-2 with optic nerve colobomas, PAX-5 with lymphoplasmacytoid lymphoma, and PAX-6 with Wilms tumor.
- Papillary thyroid cancer accounts for 80% of thyroid cancers, follicular carcinoma 10%, medullary 5%, and anaplastic 1.6%. Thyroid lymphoma can occur also, usually with a background of Hashimoto thyroiditis.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Follicular Thyroid Cancer

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## Question 42: A 55-year-old male presents with a complaint of diminished sex drive. The patient notes a decreased frequency of shaving and fatigue. Physical exam reveals decreased muscle strength. Which of the following tests is the least likely to assist in making the diagnosis?

## Choices:

1. Luteinizing hormone
2. Testosterone level
3. Thyroid function
4. Estradiol level

## Answer: 4 - Estradiol level

## Explanations:

- Males with hypogonadism may have anomalies with the genital system, decreased facial hair, libido, sexual function, muscle strength, and energy. There should be a careful genital exam.
- Studies that may be indicated in males with hypogonadism include follicle-stimulating hormone (FSH), luteinizing hormone (LH), prolactin, testosterone, thyroid function, seminal fluid examination, karyotyping, and testicular biopsy. For males after puberty, the diagnosis of hypogonadism should be based on symptoms and signs of hypogonadism plus the presence of a low morning testosterone level measured on at least two separate occasions.
- Studies indicated in females with hypogonadism include FSH, LH, prolactin, estradiol, and anti-ovarian antibody levels if gonadotropin levels are elevated, thyroid function, and karyotyping.
- Additional tests in the evaluation of patients with hypogonadism include: the adrenocorticotropic hormone stimulation test in patients in whom a form of congenital adrenal hyperplasia is suspected, luteinizing-hormone-releasing hormone stimulation testing to distinguish between true hypogonadotropic hypogonadism and constitutional delay in growth and maturation, testicular tissue testing if the testes are not palpable, as well as administering human chorionic gonadotropin and measuring testosterone response may be helpful.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hypogonadism

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## Question 43: A young female presents with increasing acne and facial hair for 6 months. She has had no changes in her libido or genitalia but has been told her voice is deeper. Her menstrual cycles have been normal. The patient is 65 inches tall and weighs 150 pounds. On exam, there are no abdominal striae or bruising. Which of the following is not an important part of the initial assessment?

## Choices:

1. Family history
2. Serum testosterone and dehydroepiandrosterone sulfate (DHEAS) levels
3. Abdominal ultrasound
4. Medication history

## Answer: 3 - Abdominal ultrasound

## Explanations:

- Hirsutism is excessive male-pattern hair growth in women.
- Virilization is the condition where elevated androgens cause signs and symptoms of enlargement of the genitals and voice changes.
- The androgens may be from the adrenal gland or ovary.
- Imaging may be useful if indicated by the findings from the workup. An ovarian ultrasound and adrenal CT or MRI can be used to evaluate for an ovarian or adrenal source of androgen production.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hirsutism

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## Question 44:

A 30-year-old woman is seen in the clinic for preconception evaluation. She is known to have hypercholesterolemia but does not have diabetes or hypertension. She has no history of myocardial infarction, cerebrovascular accident, or peripheral arterial disease. Her mother had a genetic mutation in the apolipoprotein B-100 gene and suffered a stroke at the age of 35. On examination, corneal arcus and xanthomata on both her elbows are noted. Lab tests show a total cholesterol level of 380 mg/dl and a low-density lipoprotein (LDL) level of 255 mg/dl. Current medications are rosuvastatin 20 mg and ezetimibe 10 mg. What is the most appropriate management option for her?

## Choices:

1. Continue rosuvastatin, stop ezetimibe, and advise her to proceed with conception right away
2. Stop rosuvastatin and continue ezetimibe and advise her to wait 3 months before trying to conceive
3. Stop rosuvastatin and ezetimibe, start evolocumab, and advise her to wait 3 months before trying to conceive
4. Stop all lipid-lowering agents and advise her to wait 3 months before trying to conceive

Answer: 4 - Stop all lipid-lowering agents and advise her to wait 3 months before trying to conceive

## Explanations:

- This patient most likely suffers from familial hypercholesterolemia. Familial hypercholesterolemia is an autosomal dominant mutation in one of the genes responsible for LDL metabolism, one of which is apolipoprotein B-100.
- Patients with familial hypercholesterolemia require an aggressive lowering of the LDL with multiple lipid-lowering agents.
- All lipid-lowering agents are contraindicated in pregnancy. Thus all women with familial hypercholesterolemia are recommended to stop lipid-lowering agents during pregnancy. If the patient is very high risk for cardiovascular events and has extremely uncontrolled LDL levels, lipoprotein apheresis or bile sequestrants can be used. Repeating cholesterol levels during pregnancy is debatable, but generally not advisable.
- All women on statins require a washout period of 3 months before trying to conceive. A baseline cardiovascular risk assessment should also be performed before pregnancy.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Familial Hypercholesterolemia

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## Question 45: A 55-year-old female presents with an unremitting cough in addition to polyuria, polydipsia, and menstrual irregularities for the past few months. A chest x-ray shows perihilar lymphadenopathy. Biopsy of a lymph node reveals non-caseating granulomas. Which part of the brain most likely is affected that is causing her endocrinologic problems?

## Choices:

1. Cerebellum
2. Hypothalamus
3. Corpus callosum
4. Cortical lesions

## Answer: 2 - Hypothalamus

## Explanations:

- Neurosarcoidosis in rare cases may cause neuroendocrine dysfunction involving the hypothalamus.
- Symptoms of neurosarcoidosis may present as neurogenic diabetes insipidus.
- The spinal cord can be involved causing a cauda equina clinical presentation.
- Endocrinology should be consulted in cases where the hypothalamus is affected.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Neurosarcoidosis

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## Question 46:

A 30-year old male is admitted to the hospital for colon surgery scheduled the next day. He has type 1 diabetes mellitus that is managed with a subcutaneous insulin pump (continuous subcutaneous insulin infusion) at home. The patient has removed his insulin pump in accordance with hospital policy. However, he is unable to recall his basal infusion rate. His current finger stick blood glucose is 130 mg/dL, and preoperative hemoglobin A1c is 6.5%. His body mass index is 20 kg/m2. Which of the following is the next best step in the management of this patient?

## Choices:

1. Start correctional insulin with capillary blood glucose monitoring every 4 hours
2. Initiate capillary blood glucose monitoring every 4 hours and administer long-acting basal insulin once blood glucose is greater than 180 mg/dL
3. Consult inpatient diabetes team or endocrinologist on service
4. Immediately administer long-acting basal insulin

## Answer: 4 - Immediately administer long-acting basal insulin

## Explanations:

- Insulin pumps provide basal coverage with a continuous subcutaneous infusion of rapid-acting insulin, and prandial coverage is provided by bolusing the pump to dispense the required amount of rapid-acting insulin.
- Patients with type 1 diabetes mellitus are insulin deficient. In the absence of basal insulin, they are susceptible to develop diabetic ketoacidosis (DKA).
- Due to delayed onset of action of long-acting insulin and short duration of action of rapid-acting insulin dispensed by the pump, it is recommended to administer long-acting basal insulin at least 2 hours prior to discontinuation of the insulin pump. This prevents a lapse in basal insulin supply and subsequent metabolic decompensation such as DKA.
- The dose of long-acting basal insulin to be administered is equivalent to the 24-hour basal dose of insulin delivered by the pump. An alternative method is to calculate the basal requirement based on weight. The majority of patients with type 1 diabetes mellitus are insulin sensitive and should be started on lower weight-based dosing (0.1-0.15 units/kg/day) to mitigate the risk of hypoglycemia. In the case above, it is essential to immediately administer long or intermediate-acting as his insulin pump was discontinued prematurely, which puts him at significant risk of developing diabetic ketoacidosis. As he does not recall his basal infusion rate, his basal insulin should be dosed based on weight. A safer target is to dose him on the lower end of weight-based dosing (0.1-0.15 Units/Kg/day) based on his increased insulin sensitivity. Higher weight-based dosing of 0.3-0.35 units/Kg/day poses an increased risk of hypoglycemia. Whenever a patient with an insulin pump arrives at the hospital, it is important to consult the inpatient diabetes team or endocrinologist as soon as possible. However, in this scenario, the next best step is to immediately administer basal insulin, as any further delay in basal insulin supply raises the risk of DKA.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Diabetic Perioperative Management

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## Question 47: An 18-year-old female patient presents for the evaluation of galactorrhea. She also reports amenorrhea for 2 months. She has no significant past medical history and is not taking any medications. Physical examination was unremarkable. Prolactin level was elevated at 440 (0-25 ng/dl). What is the next best step in management?

## Choices:

1. Magnetic resonance imaging (MRI) of the pituitary gland
2. Initiate treatment with dopamine agonists
3. Repeat prolactin levels in 1 month
4. Pregnancy test

## Answer: 4 - Pregnancy test

## Explanations:

- The most common cause of milk discharge from the breast is pregnancy. It is important to rule out pregnancy before any further workup or treatment.
- The high levels of estrogen in pregnancy stimulate lactotrophs and cause hyperprolactinemia.
- In patients with preexisting prolactinomas, dopamine agonists are held once the patient becomes pregnant.
- Prolactinomas can increase in size in pregnancy and visual field assessments should be done every trimester.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Galactorrhea

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## Question 48: A 7-year-old female has developed progressive neuropathy, fatty stools, diarrhea, and failure to thrive. A neurology exam reveals absent deep tendon reflexes and impaired proprioception and vibratory sensation. There are spastic gait and ataxia. Pigmentary retinal degeneration is seen, and the child has diminished night vision. The lipid profile is markedly abnormal with cholesterol of 37 mg/dL, triglycerides are 0, and HDL is 23 mg/dL. What disease is most likely?

## Choices:

1. Crohn disease
2. Abetalipoproteinemia
3. Ulcerative colitis
4. Viral gastroenteritis

## Answer: 2 - Abetalipoproteinemia

## Explanations:

- The patient has abetalipoproteinemia, a rare autosomal recessive disorder.
- Malabsorption, spinocerebellar dysfunction, a retinopathy that causes impaired night and color vision, and acanthocytosis all are characteristic.
- There is an absence of apoB-containing lipoproteins such as chylomicrons, VLDL, and LDL.
- Often symptoms arise that indicate the body is not absorbing or making the lipoproteins it needs. Usually appearing together, symptoms and signs include failure to thrive, steatorrhea, frothy stools, foul-smelling stools, protruding abdomen, intellectual disability, developmental delay, developmental coordination disorder, muscle weakness, slurred speech, scoliosis, progressive decreased vision, balance and coordination problems, acanthocytosis, retinitis pigmentosa, and hypocholesterolemia.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Abetalipoproteinemia

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## Question 49:

A 57-year-old female with a past medical history of hypertension, chronic kidney disease with a creatinine clearance of 30 mL per minute, and type 1 diabetes mellitus presents to the office after recovering from a hip fracture. She states the fracture occurred after tripping on a rug in her home. She has a history of falls secondary to her peripheral neuropathy. She has osteoporosis. Which of the following treatments will help improve her bone mineral density and decrease her chances of fracture?

## Choices:

1. Alendronate
2. Denosumab
3. Teriparatide
4. Raloxifene

## Answer: 2 - Denosumab

## Explanations:

- Denosumab is indicated for the treatment of osteoporosis in men and postmenopausal women who are at high risk of fracture.
- High fracture risk is defined as those with a known history of an osteoporotic fracture, multiple risk factors for fracture, or failed prior osteoporosis treatment.
- Denosumab is recommended to treat osteoporosis in patients with known renal disease. It has been shown to reduce both vertebral and hip fractures when accompanied by vitamin D and calcium repletion.
- Bisphosphonates are contraindicated in patients with a creatinine clearance of less than 35 mL per minute.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Denosumab

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## Question 50:

A 37-year-old female presents to the emergency room with complaints of progressive chest pain, palpitations, shortness of breath, nausea, vomiting and excessive sweating for one week. She has no known past medical history; family history is positive for Graves disease. On physical exam, the patient appears confused and anxious. Her temperature is 101.7 F; blood pressure is 180/93 mmHg, heart rate is 145 bpm and regular, respirations are 24/min, and oxygen saturation is 98%. She has bilateral basilar crackles, a hyperdynamic precordium, tachycardic with a regular rate and rhythm, and no additional heart sounds were appreciated. Additionally, she has bilateral lower extremity swelling with 2+ pitting edema. She is oriented to place only. Labs show an undetectable TSH and a free T4 of 8.0 ng/dL. EKG shows sinus tachycardia, and chest x-ray shows bilateral pleural effusions. Which of the following is an expected diagnostic finding in this patient?

## Choices:

1. A cardiac index of 4.0/min/m2 or greater on echocardiogram
2. A positive cardiac stress test
3. An elevated renin/aldosterone ratio
4. An elevated urinary and plasma fractionated metanephrines and catecholamine levels

## Answer: 1 - A cardiac index of 4.0/min/m2 or greater on echocardiogram

## Explanations:

- This patient has high output cardiac failure secondary to thyroid storm. She has untreated and likely newly diagnosed hyperthyroidism, leading to a diffuse increased metabolic demand that the heart is not able to accommodate. Such a heart may not have any primary dysfunction, however, fails to accommodate the increased demands of the body.
- Regarding cardiac output, high output cardiac failure is defined to be a resting cardiac output greater than 8 L/min or a cardiac index of greater than 3.9/min/m2 in the setting of clinical heart failure. This patient would have such expected findings on her echocardiogram driven by hyperthyroidism.
- Hyperthyroidism causes an increase in thyroid hormone, which eventually leads to an increased contractility and heart rate, however also causes a reduction in systemic vascular resistance, leading to clinical high output cardiac failure.
- High output cardiac failure is more of a consequence of an underlying disease process. The underlying etiology of this type of cardiac failure largely dictates the presenting symptoms and signs, evaluation and treatment. For example in thyroid storm, treatment is obviously different than if the cause of high output cardiac failure were to be secondary to a severe thiamine deficiency.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### High-Output Cardiac Failure

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## Question 51: A 43-year-old male comes into your clinic for complaints of increased frequency in bowel activity, neck pain, anxiety, palpitations, and unintentional weight loss despite no change in diet or physical activity. He reports that he has been experiencing these problems for the past week. He notes no instigating factor other than recently experiencing flu-like symptoms before the onset of his symptoms. An EKG reveals sinus tachycardia but no atrial fibrillation. Troponins and thyroid stimulating hormone are within the normal reference range. The free T4 is elevated beyond the normal reference range. The physical exam reveals a thin appearing, anxious gentleman. Breath sounds are clear bilaterally, and tachycardia is appreciated in the left radial artery. The neck exam reveals an exquisitely tender thyroid gland with no overt mass. He denies a history of autoimmune disorders and notes that this is the first time he has experienced these symptoms. What is the likely diagnosis?

## Choices:

1. Graves' disease
2. DeQuervain thyroiditis (subacute thyroiditis)
3. Hashimoto's thyroiditis
4. Toxic multinodular goiter

## Answer: 2 - DeQuervain thyroiditis (subacute thyroiditis)

## Explanations:

- The most common causes of hyperthyroidism include Graves' disease and toxic multinodular goiter.
- Other causes of hyperthyroidism include subacute thyroiditis, painless thyroiditis, adenoma of the thyroid, and the misuse of thyroid hormone drugs.
- DeQuervain thyroiditis, or subacute thyroiditis, is a granulomatous inflammatory condition that typically presents following an illness. The patient will complain of a painful thyroid on palpation. Subacute thyroiditis will present clinically as hyperthyroidism due to the release of thyroid hormone from ruptured thyroid follicles.
- Thyroid stimulating hormone (TSH) is a useful diagnostic tool to determine the presence of thyroid pathology. However, TSH levels can be altered due to nonthyroidal illness, and changes in TSH often lag behind changes in T4. Thus, TSH may not be a completely accurate assessment of thyroid function in the clinical context of a recent illness.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hyperthyroidism

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## Question 52:

A 60-year-old male presented to the emergency department with pain in the right upper abdomen. Abdominal examination was unremarkable. Ultrasound abdomen showed the presence of a hyperechoic mass exhibiting a "split diaphragm" sign in the right suprarenal region with undefined margins. Contrast-enhanced computed tomography (CECT) scan of the abdomen revealed a well-defined, round lesion in the right suprarenal region with heterogeneous attenuation. Which of the following histological findings is consistent with a diagnosis of adrenal myelolipoma?

## Choices:

1. A mixture of mature adipose tissue with hematopoietic elements
2. Zellballen pattern of polygonal/spindle-shaped cells in rich vascular network
3. Homer Wright pseudorosettes
4. Sheets or nests of epithelioid cells between dilated anastomotic vascular spaces, lined by similar cells

## Answer: 1 - A mixture of mature adipose tissue with hematopoietic elements

## Explanations:

- Adrenal myelolipomas are rare lesions and are found in 0.1 to 0.2% percent of autopsies. They contain macroscopic amounts of marrow fat, the "myelo" representing marrow and the "lipo" representing fat.
- On histopathologic examination, myelolipomas are predominantly composed of fatty areas with interspersed hematopoietic tissue components. These fatty elements and hematopoietic areas may be clearly separated, or they are often intermixed.
- On ultrasound, they often are uniformly hyperechoic. Unlike adrenal hemorrhage, which also can be hyperechoic, the myelolipoma shows a "split diaphragm" sign because of the different rate of sound transmission in fat.
- Adrenal myelolipoma is a benign adrenal neoplasm predominantly composed of mature adipose tissue and intermixed myeloid tissue. They comprise 6-16% of adrenal incidentalomas and are the second most common cause after adrenal adenomas.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Adrenal Myelolipoma

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## Question 53:

A 17-year-old female is brought to the emergency department by emergency medical services. She is too delirious to give a history but alert enough to complain of stomach pain. She is noted to be hypotensive and tachycardic. She is afebrile. Her exam is unremarkable except for dry mucous membranes. Intravenous fluids are started. Serum chemistry shows that the potassium is elevated and sodium is decreased. Blood glucose is borderline decreased. The electrolytes are otherwise within normal limits. A CBC is unremarkable. After 3 liters of fluids, the patient is still hypotensive. What is the definitive treatment for this patient's condition?

## Choices:

1. Vasopressors and broad-spectrum antibiotics
2. Insulin drip
3. Fluids and corticosteroids
4. CT abdomen and pelvis

## Answer: 3 - Fluids and corticosteroids

## Explanations:

- This presentation, lab abnormalities, and hypotension unresponsive to fluid resuscitation are most consistent with an acute adrenal crisis. The definitive treatment for adrenal crisis is fluids and steroids.
- An insulin drip would be indicated in a patient with diabetic ketoacidosis (DKA). A patient in DKA would be expected to have elevated potassium and decreased sodium, but the glucose would most likely be elevated. Additionally, the sodium bicarbonate would be low in DKA.
- Vasopressors and broad-spectrum antibiotics would be indicated in a septic patient. While this patient is hypotensive and tachycardic, she was afebrile and did not have leukocytosis.
- The patient had altered mental status and complaining of abdominal pain. While it would be reasonable to consider getting a CT of the abdomen and pelvis, it would not be the definitive treatment of the underlying condition.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Adrenal Crisis

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## Question 54:

An 18-year-old man is seen in the primary care clinic to establish primary care. He does not report any symptoms. His father had a myocardial infarction at age 42. He has several paternal relatives with myocardial infarction before the age of 55. His physical exam is normal and there is no tendon xanthomas or corneal arcus. Familial hypercholesterolemia (FH) is suspected. Which of the following is the most accurate statement?

## Choices:

1. He does not have familial hypercholesterolemia as physical exam does not reveal tendon xanthomas or corneal arcus
2. Genetic testing for FH related mutation is the next test for diagnosis
3. A lipid panel is the next step
4. A coronary angiogram is the next step

## Answer: 3 - A lipid panel is the next step

## Explanations:

- Xanthomas, which are yellowish patches of cholesterol build-up due to extremely high levels of LDL-C, can occur around eyelids (xanthelasma), within tendons of the elbows, hands, knees, and feet. In fact, a thickened Achilles tendon should raise a high level of suspicion for homozygous FH. The prevalence of xanthomas increases with age. The absence of tendon xanthomas does not rule out FH.
- Another diagnostic sign on the physical exam is corneal arcus, a white, gray, or blue opaque ring around the corneal margin when seen in individuals younger than 45. The absence of corneal arcus does not rule out FH.
- It is important to emphasize that any LDL-C level greater than 190 mg/dL should trigger an investigation for HeFH or HoFH. It is important to note that about 30% to 50% of patients with FH phenotype do not have an identifiable gene defect and thus gene testing is not a requisite for the diagnosis which is in most cases clinical.
- Cardiovascular risk assessment tools such as the Framingham risk score should not be used as FH is a lifetime coronary risk equivalent.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Familial Hypercholesterolemia, Type 2A

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## Question 55: A 55-year-old male with obesity, sleep apnea, prediabetes, and hypertension has a hormonal profile drawn. Which one of the following would be expected?

## Choices:

1. Hyperadiponectinemia
2. Hypoleptinemia
3. Hypogonadism
4. Hypoinsulinemia

## Answer: 3 - Hypogonadism

## Explanations:

- Obesity associated with sleep apnea is strongly associated with male hypogonadism.
- Obesity causes adiponectin levels to decrease.
- Obesity causes leptin levels to rise.
- Obesity causes hyperinsulinemia.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hypogonadism

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## Question 56: A registered nurse is brought to the emergency department after a seizure. She was found unresponsive with an undetectable blood sugar. Two ampules of 50% glucose were administered with the elevation of her blood sugar to 42 mg/dL. She has a history of depression. Which of the following finding would be consistent with exogenous insulin overdosage?

## Choices:

1. Plasma insulin greater than 18 pmol/L, plasma glucose less than 55 mg/dL, and C-peptide greater than 0.6 ng/ml
2. Plasma insulin greater than 18 pmol/L, plasma glucose less than 55mg/dL, and C-peptide greater than 0.6 ng/ml
3. Plasma insulin greater than 18 pmol/L, plasma glucose less than 55 mg/dL, and C-peptide undetectable
4. Plasma insulin less than 18 pmol/L, Plasma glucose less than 55 mg/dL, and C-peptide undetectable

## Answer: 3 - Plasma insulin greater than 18 pmol/L, plasma glucose less than 55 mg/dL, and C-peptide undetectable

## Explanations:

- Exogenous insulin administration should be considered in patients with profound hypoglycemia and no history of diabetes mellitus.
- The measurement of C-peptide and insulin level is useful in differentiating between exogenous and endogenous insulin administration. The C-peptide is a marker for endogenous insulin. The C-peptide levels will be low in patients with insulin overdose and high in patients with hypoglycemia resulting from an insulin secretagogue overdose.
- The three needed tests are plasma glucose, plasma insulin, and C-peptide level.
- C-peptide levels less than 0.6 ng/mL would suggest exogenous hyperinsulinemia if plasma insulin measurement is high and hypoglycemia diagnosed.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Insulin

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## Question 57: An 11-year-old obese male comes to the clinic for a routine visit. His BMI and weight are above the 97th percentile, and his height is in the 85th percentile. He has a heart rate of 88 beats per minute, and blood pressure is 120/81 mmHg. He has no temperature intolerance, no constipation, or diarrhea and denies dry skin. Thyroid function test show TSH 2.3 mIU/L (0.3-4.2 mIU/l), total T4 3.5 microg/dL (5.5-12.8 microg/dL) and free T4 1.1 /ng/dL (0.76-1.46 ng/dL), Which of the following best idenfities the gene implicated in this disorder?

## Choices:

1. TTR
2. SERPINA 6
3. SERPINA 7
4. MAP3K1

## Answer: 3 - SERPINA 7

## Explanations:

- This patient has thyroxine-binding globulin (TBG) deficiency based on a normal TSH, and free T4 and low total T4 and the protein that is responsible for this is thyroxine binding globulin on TBG. TBG is encoded by a gene called SERPINA 7.
- TBG is encoded by SERPINA 7, it is a serine protease inhibitor, and it is found on the x chromosome.
- Mutations in the SEPINA 7 gene can cause alterations in the level of TBG, which in turn can cause a decrease in total T4 but not in the free T4 as TBG bound to T4. As such, patients do not experience symptoms since there is no change in the level of free T4.
- TTR is responsible for making transthyretin, which is another major transport protein for thyroid hormones, but this does not result in TBG deficiency. The SERPINA 6 gene is responsible for making corticosteroid binding globulin, and MAP3K1 is a gene that plays multiple roles in signaling pathways. These two genes are not implicated in TBG deficiency.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Thyroxine-Binding Globulin Deficiency

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## Question 58: A 22-year-old female with a strong family history of diabetes for over 3 generations was found to have hyperglycemia on her routine blood testing when she is first hired at a new job. Most of the members of her family were diagnosed with diabetes at a young age and were mainly treated with oral medications. Upon further questioning, the patient reports that her older brother has autism, and both her grandmother and mother were told that they have kidney cysts. The clinician suspects MODY syndrome and the patient agrees to undergo genetic testing. For which type of MODY should she be checked?

## Choices:

1. MODY 1 (HNF4A)
2. MODY 3 (HNF1A)
3. MODY 5 (HNF1B)
4. MODY 6 (NEUROD1)

## Answer: 3 - MODY 5 (HNF1B)

## Explanations:

- MODY 5 is a rare type of inherited diabetes mellitus. It is associated with a mutation in the hepatocyte nuclear factor-1beta gene (HNF1B). MODY 5 is also referred to as renal cysts and diabetes syndrome (RCAD). Renal cysts are the commonest renal abnormality in these patients, but they can also present with renal magnesium wasting and hypomagnesemia. Those patients can also present with neuropsychiatric abnormalities, including intellectual disability and autism.
- MODY 3 (HNF1A) carries a high risk of microvascular and macrovascular complications. These patients can also have high levels of HDL cholesterol and low levels of CRP that distinguishes them from type 2 diabetes.
- Patients with MODY 1 (HNF4A) can have vascular complications. Also, given the fact that HNF4A is also expressed in the liver, the elevation of serum lipids and metabolic syndrome can occur.
- MODY 6 (NEUROD1) can cause diabetes in children, neurological abnormalities, and learning disabilities.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Maturity Onset Diabetes in the Young

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## Question 59:

A 69-year-old male with uncontrolled hypertension, diabetes mellitus type 2, depression, and neuropathic pain comes with the complaint of excessive worry and guilt. He mentions that he has been having thoughts of suicide for the past month, and he is unable to maintain his concentration. His sleep and appetite have decreased, and he is excessively worried about what would happen to his wife if something happens to him. He is not able to sleep at night because the pain in his feet never goes away. He states that "These problems have just worsened, although they were well controlled a month back, we lost a son to a tragic accident, and I am still not over it." He has been taking metformin 500 mg BID, captopril 50 mg BID, and amitriptyline 50 mg at bedtime. Which of the following is the next step in management?

## Choices:

1. Increase the dose of amitriptyline
2. Add duloxetine to the current regimen
3. Add gabapentin to the current regimen
4. Increase the dose of amitriptyline and add gabapentin

## Answer: 4 - Increase the dose of amitriptyline and add gabapentin

## Explanations:

- The patient has come with complaints of depression and neuropathic pain primarily. Amitriptyline is a drug that is FDA approved for the treatment of depression and neuropathic pain.
- The patient had a tragic event in his life and his depression relapsed. The antidepressant has previously worked, and it would not be logical to change it now.
- The most appropriate response would be to increase the dose of amitriptyline and add gabapentin to the regimen so that his neuropathic pain can also be controlled.
- Amitriptyline cannot be used with duloxetine as it would cause a serotonin surge and hence the serotonin syndrome.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Peripheral Diabetic Neuropathy

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## Question 60:

A 62-year-old male patient has a long history of a simple goiter. One month ago, he started complaining of difficulty in swallowing. He is a known case of controlled hypertension, diabetes mellitus, and heart failure. He had two myocardial infarctions with the last one occurring 1 month ago. On examination, he has a huge goiter that has not extended retrosternally. The anesthesiologist assesses that he is unfit for surgery. What is the most appropriate treatment?

## Choices:

1. Preoperative optimization and total thyroidectomy after appropriate preparation
2. Radioiodine ablation
3. Oral thyroxine tablets
4. There is no need for treatment, just follow up

## Answer: 2 - Radioiodine ablation

## Explanations:

- Generally, the most effective treatment of symptomatic multinodular goiter is surgery. However, in nonfit patients, radioactive iodine ablation is the best alternative choice.
- Radioactive iodine ablation is used in the treatment of symptomatic goiter when the surgical intervention is contraindicated. It reduces 40% to 60% of goiter size after two years. It causes complications such as thyroiditis and hypothyroidism.
- Radioactive iodine ablation is the second choice in the treatment of symptomatic goiter. Medical therapy can be tried in the nonfit patient but it has been shown that it has no effect on decreasing goiter size especially in those present for more than 2 years.
- Multinodular goiter needs no intervention if it is asymptomatic and nonfunctional. With symptoms, treatment is indicated in the following in near total or total thyroidectomy. If patients with comorbidities, radioactive iodine ablation can be tried.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Nontoxic Goiter

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## Question 61: A 60-year old male presents with his third episode of ureteral stones. Work up reveals that he has hyperparathyroidism. It is suspected that he may have a parathyroid adenoma. What test is most helpful for the surgeon prior to taking the patient for surgery?

## Choices:

1. Neck ultrasound
2. Sestamibi nuclear scan
3. MRI
4. CT scan

## Answer: 2 - Sestamibi nuclear scan

## Explanations:

- The sestamibi nuclear scan is not only reliable but also very sensitive for parathyroid adenomas.
- The sestamibi scan produces a 3-dimensional image that can be used as a visual reference by the surgeon.
- Ultrasound is useful but is very operator dependent.
- Plain x-rays have little or no value in patients with a lesion in the parathyroid glands.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Parathyroid Adenoma

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## Question 62:

A 55-year-old obese male comes to the clinic for a follow-up visit. He has a history of hypertension and diabetes mellitus. Hyperlipidemia was diagnosed three months ago, and he was started on simvastatin 40 mg once daily. Routine labs reveal alanine aminotransferase (ALT) 85 IU/L, aspartate aminotransferase (AST) 40 IU/L, albumin 2.4 mg/dl, bilirubin 0.2 mg/dl, and INR 1.0. What would be the next appropriate step?

## Choices:

1. Stop simvastatin
2. Switch to atorvastatin
3. Continue the same dose and repeat labs at follow up visit in three months
4. Reduce the dose of simvastatin

## Answer: 3 - Continue the same dose and repeat labs at follow up visit in three months

## Explanations:

- Mild elevations of ALT with simvastatin are usually self-limited. It is not an indication to stop simvastatin.
- Mild elevation of ALT with simvastatin does not require dose modification.
- Simvastatin should be stopped if ALT is greater than 10 times the normal range or if it is more than three times normal in three months.
- Switching to another statin is not the most appropriate option here since the elevation of ALT is mild. In case of severe liver injury, switching to another statin is a safe option.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Liver Toxicity

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## Question 63:

A 30-year-old female presents to the hospital for severe nausea and vomiting along with a two-day history of fever and cough. She has type 1 diabetes mellitus and has been using insulin since diagnosis 14 years ago. Her regimen is glargine insulin 25 U SQ BID and also uses an insulin pump. On examination, the patient has dry mucous membranes and appears somewhat lethargic. She has a bout of severe abdominal pain and that is relieved by some morphine. Two intravenous lines with normal saline and insulin are started. Labs are drawn showing blood glucose of 500 mg/dL. The laboratories show sodium 131 mEq/dL, potassium 3.1 mEq/dL, chloride 90 mEq/dL, bicarbonate 13 mEq/dL, BUN 28 mg/dl, and creatinine 0.88 mg/dL. Arterial blood gas shows pH 6.98, PO2 92, and PCO2 28. What are the changes to the management needed?

## Choices:

1. Continue normal saline and insulin, supplement potassium, and start broad-spectrum antibiotics
2. Replace normal saline with a bicarbonate drip, continue insulin, supplement potassium, and start broad-spectrum antibiotics
3. Continue normal saline, stop insulin, supplement potassium, and start broad-spectrum antibiotics
4. Replace normal saline with a bicarbonate drip, stop insulin, supplement potassium, and start broad-spectrum antibiotics

## Answer: 3 - Continue normal saline, stop insulin, supplement potassium, and start broad-spectrum antibiotics

## Explanations:

- Once the potassium level falls below 3.3, it is recommended that the insulin is stopped and reinitiated once potassium is supplemented adequately. If the insulin is continued, the potassium levels fall further, and there is a risk of cardiac arrhythmias with severe hypokalemia.
- There is no indication of bicarbonate replacement above a pH of 6.9 and may be associated with increased harm including cerebral edema
- Broad-spectrum antibiotics are indicated in this patient with a possible infectious trigger for ketoacidosis
- Potassium supplementation should be done on low and normal potassium levels in anticipation of the transcellular shifts lowering the levels during treatment of diabetic ketoacidosis with insulin.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Ketoacidosis

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## Question 64:

A 62-year-old female is diagnosed with a Helicobacter pylori infection that is causing peptic ulcer disease. She is appropriately treated with two antibiotics and a proton pump inhibitor, which is continued long term. The patient's symptoms recur. Stool tests and a urea breath test are negative for recurrence of H. pylori, so a repeat endoscopy is done. Persistent and new ulcers are noted. Fasting gastrin and basal acid secretion are elevated. What is the best next step?

## Choices:

1. Secretin-stimulated gastrin levels
2. Gastrin levels after a meal
3. Double the proton pump inhibitor dose
4. Re-treat for H. pylori

## Answer: 1 - Secretin-stimulated gastrin levels

## Explanations:

- In order to make the diagnosis of Zollinger-Ellison syndrome (ZES), a secretin-stimulated gastrin level should be done.
- If 2 picograms/kilogram of secretin intravenously increases gastrin levels by more than 200 picograms within 15 minutes, this is more than 90% sensitive and specific for ZES.
- Endoscopic ultrasound may identify the location of the gastrinoma.
- A somatostatin radioscan is very sensitive for detecting the primary location of metastatic lesions of ZES. Other tests include upper endoscopy and CT scan.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Zollinger Ellison Syndrome

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## Question 65: Which of the following is true regarding maturity-onset diabetes of the young (MODY)?

## Choices:

1. MODY is a monogenic disorder that has been associated with gene defects residing in pancreatic beta cells but no other tissues
2. All patients with type 2 diabetes mellitus should be tested for MODY because it might spare a patient from the adverse effects associated with insulin therapy
3. MODY is an autoimmune disease similar to type 1 diabetes mellitus
4. MODY should be suspected in a lean individual who is younger than 25 years of age with diabetes mellitus that is adequately managed with sulfonylurea therapy and who has a strong family history of diabetes mellitus across three generations

Answer: 4 - MODY should be suspected in a lean individual who is younger than 25 years of age with diabetes mellitus that is adequately managed with sulfonylurea therapy and who has a strong family history of diabetes mellitus across three generations

## Explanations:

- Maturity-onset diabetes of the young (MODY) is a monogenic disorder associated with beta cell defects causing impairment of insulin production or glucose sensing. However, MODY genes have been found in a variety of tissues besides the pancreas, including the kidney, liver and intestines.
- The diagnostic criteria for MODY include the age of onset in a family member of 25 years of age, at least two consecutive generations of patients with diabetes in the family, no beta-cell autoantibodies, persistent endogenous insulin production in addition to preservation of pancreatic beta-cell function as evidenced by c-peptide levels >200pmol/L in addition to lack of necessity for insulin therapy even years after diagnosis.
- Because MODY occurs so much less frequently than types 1 or 2 diabetes mellitus, it should be tested for only in cases where the presentation does not fit well with types 1 or 2 diabetes mellitus in young patients. Since it constitutes less than 5 percent of Type 2 diabetes, it is not cost effective to universally screen for mutations in all patients.
- MODY is seen in individuals that present with features of type 1 diabetes mellitus, such as lean body habitus, and type 2 diabetes mellitus, such as a strong family history usually autosomal dominant inheritance and can be managed with oral sulfonylurea therapy.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Maturity Onset Diabetes in the Young

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## Question 66: An 11-year-old female is brought to the clinic with complaints of excessive thirst and frequent urination for the past week. There is a history of type 1 diabetes in the family, so random glucose and hemoglobin A1c are ordered, and the results indicate 102 mg/dL for the glucose level and A1c resulted at 5.7%. Being that there is a history of T1D in the family, they are nervous and asks for additional testing. What would be the most appropriate next test to order for this patient?

## Choices:

1. Fasting blood glucose
2. 2-hour oral glucose tolerance test
3. 4-hour oral glucose tolerance test
4. Urinalysis

## Answer: 2 - 2-hour oral glucose tolerance test

## Explanations:

- A glucose tolerance test is used to determine a person's ability to handle a glucose load. The test can show whether a person can metabolize a standardized measured amount of glucose. The results can be classified as normal, impaired, or abnormal.
- A glucose tolerance test may be used to diagnose type 1 diabetes mellitus, type 2 diabetes mellitus, and gestational diabetes mellitus. It is a blood test that involves taking multiple blood samples over time, usually 2 hours.
- A 2-hour glucose tolerance test is the standard for diagnosing T1D when the patient has symptoms but random glucose and A1c are not within the diagnostic range.
- A fasting blood glucose, although important, may not give the full picture of impaired insulin secretion. A 4-hour glucose tolerance test is not appropriate in this scenario. Urinalysis is not diagnostic for diabetes.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Glucose Tolerance Test

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## Question 67: A 17-year-old female presents to the clinic with symptoms of hypoglycemia. During the biochemical evaluation, she is found to have elevated levels of pro-insulin, insulin, and C-peptide. Her past medical history is significant for primary hyperparathyroidism, diagnosed one year ago. She mentions that her father was diagnosed with primary hyperparathyroidism when he was 20 years old. What should be done for further evaluation of this patient?

## Choices:

1. Genetic testing for RET gene mutation
2. Endoscopic ultrasound of the pancreas
3. Sequence analysis of the MEN1 gene and endoscopic ultrasound of the pancreas
4. Plasma calcitonin level

## Answer: 3 - Sequence analysis of the MEN1 gene and endoscopic ultrasound of the pancreas

## Explanations:

- The patient has been diagnosed with two primary manifestations of multiple endocrine neoplasia (MEN) type 1 – primary hyperparathyroidism and hypoglycemia concerning for pancreatic neuroendocrine tumor (PNET).
- That patient should undergo genetic testing for MEN type 1 to confirm the diagnosis. If the diagnosis of MEN type 1 is confirmed, then the patient should be screened for other tumors. Likewise, the patient should inform her family members and encourage them to do the same.
- Endoscopic ultrasound is the most sensitive modality for the detection of an insulinoma.
- Serum calcitonin levels should be obtained in the workup for medullary thyroid cancer, which is seen in MEN type 2 syndromes, not MEN type 1. Genetic testing for RET gene mutation is also for MEN 2.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Multiple Endocrine Neoplasia Type 1

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## Question 68:

A 38-year-old male physician presents to your clinic with a complaint of bloody sputum for the past two weeks. History is significant for three recent travel trips including one month in India and two months in Africa for medical mission trips. For the past two months, he has also lost 10 lbs and woken up in the middle of the night drenched in sweat. He believes the night sweats are due to nightmares of losing his current patients who are fighting infections of tuberculosis and malaria. After ordering and reviewing the appropriate labs, you diagnose the physician and start him on combination therapy for his condition. Two months later you learn he was admitted to the ICU at the local hospital due to a medication side effect. Prior to his admission, hospital records state he experienced fluctuating paresthesias in his lower extremities with burning pain. Requesting his labs, you notice the following: pH of 7.24, pCO2 of 32, PaO2 of 96, HCO3 of 18. His sodium is 144, potassium is 4.6, and chloride is 102. You realize the patient has a _____ acid-base disturbance with an anion gap of ___ caused by _____ medication.

## Choices:

1. Metabolic alkalosis, 16, rifampin
2. Metabolic acidosis, 12, dapsone
3. Respiratory alkalosis, 24, pyridoxine
4. Metabolic acidosis 24, isoniazid

## Answer: 4 - Metabolic acidosis 24, isoniazid

## Explanations:

- Common causes of elevated anion gap metabolic acidosis can be remembered with the mnemonic MUDPILES (Methanol, Uremia, DKA, Polyethylene glycol, ISONIAZID, iron tablets, Lactic acidosis, ethanol, and salicylate poisoning). Our patient has tuberculosis treated with RIPE combination therapy, specifically isoniazid. The associated peripheral neuropathy tells you that he was not prescribed vitamin B6 concurrently, resulting in his admission symptoms.
- Isoniazid toxicity includes seizures, metabolic acidosis with an elevated anion gap, and peripheral neuropathy by decreased vitamin B6 levels. Patients are concurrently prescribed vitamin B6 as it has been proven to prevent peripheral neuropathy and improve INH (isoniazid) induced metabolic acidosis though the exact mechanism is unclear.
- INH is known to substitute NAD in the Krebs cycle resulting in minimal increases in lactic acid. However, significant metabolic acidosis is seen with INH overdose resulting in seizures. The rapid rhythmic contractions of musculature during a seizure results in significant lactic acidosis that when combined with INH interference of the Krebs cycle, results in high anion gap metabolic acidosis.
- When answering acid-base questions, first review the pH level. Is it acidic or basic? In this case, acidic so you know that one and three cannot be the right answer. Next, you move to review the PaCO2 and the HCO3 to determine the primary disturbance. With a decreased carbon dioxide and decrease bicarbonate, the primary disturbance is metabolic acidosis, leaving two and four as possible choices. Next, you calculate the anion gap (Na - (Cl + HCO3)) to determine if it is elevated or normal (8 - 12). In this case, it is elevated at 24. For this reason, four is correct. In three, pyridoxine corrects metabolic acidosis caused by INH so it cannot be the right answer, as well. When answering questions with multiple parts, use test-taking skills to use the process of elimination along with your clinical knowledge to ensure the correct choice.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Biochemistry, Anion Gap

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## Question 69: A 30-year-old male presents to the clinic complaining of a wing-beating tremor, changes in behavior, depression, and psychosis. Further testing shows the presence of copper in the Descemet membrane and mutations in the ATP7B gene on chromosome 13, producing a defective protein. Treatment involving a chelator is initiated. Which of the following changes are this patient's kidneys at the highest risk for with long term therapy?

## Choices:

1. Effacement of the podocytes
2. Presence of crescent-shaped fibrin deposits in the glomerulus
3. Spike and dome appearance on microscopy in the kidneys
4. Tram-track appearance on microscopy in the kidneys

## Answer: 3 - Spike and dome appearance on microscopy in the kidneys

## Explanations:

- This patient has Wilson disease. It is a condition characterized by mutations in the ATP7B gene found on chromosome 13. The onset of symptoms usually occurs between ages 5-35 and has a prevalence of 1/30,000.
- Penicillamine is a chelator used in the treatment of Wilson disease. The most common side effect includes diarrhea, dysgeusia, and skin rashes. It is highly advised to stop treatment if the drug provokes an immune reaction.
- Long term therapy with penicillamine can cause membranous nephropathy. On microscopy, spike and dome changes can be seen. It is often advised to monitor changes in urine albumin during treatment. The proteinuria can improve after stopping the drug, and the mean time to resolution is between 9 -12 months. In some rare cases, it can last up to 2-3 years.
- Penicillamine has also shown some benefits in the treatment of rheumatoid arthritis. It can depress T-cell activity that is involved in the pathophysiology of the disease.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Penicillamine

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## Question 70:

A 29-year-old woman complains of palpitations, sweating, and severe headaches that started two months ago. The symptoms occur and resolve spontaneously. The patient's past medical history and medication history are unremarkable. She does not use tobacco or alcohol. Physical examination shows a thin woman that appears anxious and is sweating. The thyroid gland is of normal size and has no nodules. Blood pressure is 150/100 mm Hg, and pulse is 120 beats/min. Blood tests and imaging support the diagnosis of a hormone-secreting tumor. The patient is scheduled for surgery to remove the tumor in two weeks. During the surgery, the patient rapidly becomes hypotensive. Her blood pressure falls from 110/82 mm Hg to 80/50 mm Hg. What is the best treatment for this patient's hypotension?

## Choices:

1. Bolus of intravenous normal saline followed by continuous normal saline infusion
2. Intravenous phentolamine
3. Intravenous ephedrine
4. Intravenous phenylephrine

## Answer: 1 - Bolus of intravenous normal saline followed by continuous normal saline infusion

## Explanations:

- This patient with palpitations, sweating, severe headaches, hypertension, and tachycardia that comes and goes likely has a pheochromocytoma.
- Pheochromocytoma is a catecholamine-secreting tumor that arises from the chroffamin cells of the adrenal medulla.
- Prior to surgically removing the tumor, patients should be started on a non-selective alpha and beta-blocker (e.g., phenoxybenzamine) to prevent intra-operative hypertension. Surgical complications of adrenalectomy for pheochromocytoma include hypertension, hypotension, cardiac arrhythmias, and hypoglycemia.
- Hypotension occurs due to a decrease in catecholamine secretion after adrenal removal paired with the effects of persistent alpha blockade from preoperative long-acting alpha-blockade (e.g., phenoxybenzamine). Intra- and postoperative hypotension responds well to intravenous fluids. Pressors may be given if the hypotension is unresponsive to intravenous fluids.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Chromaffin Cell Cancer

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## Question 71: A 65-year-old male presents with an enlarging, painless thyroid nodule. Bloodwork shows an elevated thyroid stimulating hormone level and is positive for anti-thyroid peroxidase and anti-thyroglobulin antibodies. Histological exam shows dense lymphoplasmacytic infiltrate with the formation of lymphoid follicles. What is this patient at risk for developing?

## Choices:

1. Thyroid storm
2. Hypocalcemia
3. Lymphoma
4. Thyroid cancer

## Answer: 3 - Lymphoma

## Explanations:

- HLA-DR5 is implicated in Hashimoto thyroiditis. Many patients have a family history of the disease.
- Different ethnic groups have different genes linked to the disease. It is more common in patients with Down, Klinefelter, and Turner syndromes.
- Autoantibodies including anti-thyroglobulin, anti-thyroid peroxidase, and anti-TSH receptor are seen in Hashimoto thyroiditis.
- Non-Hodgkin lymphoma of the thyroid is a possible complication.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hashimoto Thyroiditis

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## Question 72: A 23-year-old-female is referred to the clinic for primary amenorrhea, absent uterus, and blind vaginal pouch. Genetic testing reveals 46XX karyotype. Physical examination is suggestive of normal ovarian function with normal axillary and pubic hair. Which of the following is the most likely diagnosis?

## Choices:

1. Partial androgen insensitivity syndrome
2. Mullerian agenesis (Mayer-Rokitansky-Kuster-Hauser syndrome)
3. Mild androgen insensitivity syndrome (MAIS)
4. Hypergonadotropic hypogonadism

## Answer: 2 - Mullerian agenesis (Mayer-Rokitansky-Kuster-Hauser syndrome)

## Explanations:

- Mullerian agenesis (Mayer-Rokitansky-Kuster-Hauser syndrome) is included in the differentials in a female who presents with primary amenorrhea, absent uterus, and blind vaginal pouch.
- The difference being, women with Mullerian agenesis, a 46XX karyotype, have a normal ovarian function, serum androgen, and estrogen concentrations.
- They, therefore, present with normal axillary and pubic hair.
- MAIS usually presents as a normal male phenotype with isolated micropenis. In adulthood, it may be associated with gynecomastia and infertility.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Androgen Insensitivity Syndrome

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## Question 73:

An 18-year-old girl presents to her provider for evaluation of primary amenorrhea. Initially, the patient had presented to her provider about three years ago with concerns of short stature and delayed puberty. She was diagnosed with constitutional delay of puberty. However, even after three years, she did not show any signs of pubertal development and was referred to an endocrinologist. The examination was significant for short stature (4'11"), and absent breast development. Pituitary hormonal profile assessment reveals: Prolactin (0-25 ng/ml) 35, IGF-1 (116-341 ng/ml) 119, Free T4 (0.9-1.7 ng/dl) 0.54, ACTH (7.2-63.3 pg/ml) 19, Cortisol (6.2-19.4 mcg/dl) 12, Luteinizing hormone (1.14-8.75 mIU/ml) 1.39, and Follicle-stimulating hormone (0.95-11.95 mIU/ml) 6.14. Ultrasound of the pelvis shows prepubertal adnexal structures. Magnetic resonance imaging of the pituitary gland shows a 5 cm pituitary tumor compressing the optic chiasma, and involving bilateral cavernous sinuses. What is the next step in the management of this girl?

## Choices:

1. Referral to neurosurgery for surgical removal of the tumor
2. Referral to radiation oncology for radiotherapy
3. Serial dilution of prolactin
4. Start gonadotropin releasing hormone therapy for induction of puberty

## Answer: 3 - Serial dilution of prolactin

## Explanations:

- Prolactinomas can present in prepubertal female patients as primary amenorrhea. Prolactin disrupts the release of gonadotropin-releasing hormones causing pubertal disturbances.
- Prolactin levels can be falsely low in patients with extremely high prolactin levels due to the "hook effect." Prolactin levels are assessed by a sandwich ELISA where prolactin molecules bound to both the capture and detection antibodies are detected. In instances of extremely high prolactin levels, the number of molecules bound to both the antibodies is minuscule and therefore the prolactin level is falsely low. Dilution of the sample (1:10 or 1:100) decreased the number of prolactin molecules in the sample however increases the probability of the molecules to bind to both capture and detection antibodies, thereby showing a paradoxical rise in the prolactin levels.
- Hook effect should be suspected in cases where the history is suggestive of a prolactinoma, and imaging reveals a big tumor, but the prolactin level is low.
- Assessing for hook effect and diagnosing prolactinomas as they are managed medically unlike other pituitary tumors where the mainstay of treatment is surgery.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Galactorrhea

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## Question 74:

A 68-year-old male with poorly controlled diabetes mellitus presents with bilateral foot pain. He says, "I feel like cactus spikes are sticking in my feet." He gets a searing, sharp pain when putting on socks, shoes, or walking around. The pain subsides when his feet are bare and elevated, so he has been avoiding ambulation. Acetaminophen nor ibuprofen relieve his pain. He denies any other symptoms or concerns. The foot exam reveals no skin breaks or signs of infection. There is diminished sensation to monofilament pressure on the plantar surface bilaterally and pain to monofilament pressure on select, dorsal portions of his feet. His gait is stilted, and he winces as he limps awkwardly. What is the most accurate statement regarding his pain?

## Choices:

1. He is suffering from allodynic pain
2. The severity of his pain will correlate with sensory loss
3. He can expect to be pain-free if he successfully controls his blood glucose
4. He can expect to be pain-free if he takes amitriptyline

## Answer: 1 - He is suffering from allodynic pain

## Explanations:

- At least 10% of people who have diabetes mellitus will develop neuropathic pain. The neuropathic pain can include allodynia, hyperalgesia, or other kinds of pain such as feelings of electric shocks or a burning sensation. This patient is experiencing pain with stimuli (the monofilament, wearing socks) that should not cause pain and thus has allodynia.
- The severity of diabetic neuropathic pain often does not correlate with the degree of sensory deficit.
- While tricyclic antidepressants, such as amitriptyline, are helpful in treating allodynia, the goal of treatment is to achieve a reasonable amount of relief and improved function. Usually, it is not possible to relieve all of a patient's allodynia. Providers should set clear patient expectations from the start of treatment.
- Other first-line agents for neuropathic pain include serotonin and norepinephrine reuptake inhibitors (SNRIs), gabapentin, and pregabalin.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Allodynia

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## Question 75: A 52-year-old white male with a recent diagnosis of necrolytic migratory erythema presents asking about treatment options for his disease. He is otherwise healthy and has no other major comorbidities. Abdominal CT and selective celiac angiography have demonstrated a mass in the tail of the pancreas as well as metastases to the surrounding peripancreatic lymph nodes. What treatment plan would give this patient the best outcome?

## Choices:

1. Lanreotide only
2. Chemotherapy with 5-fluorouracil and streptozotocin
3. Surgical excision of the mass only
4. Surgical excision of the mass plus lanreotide

## Answer: 4 - Surgical excision of the mass plus lanreotide

## Explanations:

- Necrolytic migratory erythema is associated with the glucagonoma, most commonly located in the tail of the pancreas.
- Surgical excision of the primary tumor confers a survival benefit even in the presence of tumor metastases.
- Somatostatin analogs (e.g., lanreotide) can abolish the effects of glucagon excess and are used to palliate symptoms of hyperglucagonemia. They have also been shown to increase survival.
- Use of somatostatin analogs in conjunction with excision of the tumor is typically used in the treatment of glucagonoma.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Necrolytic Migratory Erythema

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## Question 76: A 73-year-old man with a medical history of hypertension, hyperlipidemia, chronic stable angina and type 2 diabetes. He takes simvastatin 20 mg daily, lisinopril 10 mg daily, clopidogrel 75 mg daily, ranolazine 1000 mg twice a day and glipizide 2.5 mg a day. His provider would like to initiate metformin therapy because the Hemoglobin A1c is 9. What drug interactions should prompt concern?

## Choices:

1. Ranolazine and clopidogrel
2. Ranolazine and glipizide
3. There are two interactions to consider, simvastatin with ranolazine and metformin with ranolazine
4. Ranolazine and lisinopril

## Answer: 3 - There are two interactions to consider, simvastatin with ranolazine and metformin with ranolazine

## Explanations:

- Ranolazine is a substrate of CY3A4 enzymes. Dose adjustments may be required when it is co-administered with other CYP3A4 substrates as it may increase their plasma concentration levels.
- Simvastatin, a CYP3A4 substrate, should be limited to 20 mg a day when prescribed with ranolazine to reduce the risk of simvastatin side effects, e.g., myalgia.
- Other CYP3A4 substrates that may require dose adjustments when administered with ranolazine include cyclosporine and tacrolimus.
- Use of ranolazine 1000 mg twice a day with metformin increases metformin levels. When co-administered together, metformin dose should not exceed 1700 mg daily.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Ranolazine

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## Question 77:

A 66-year-old woman presents to the clinic for progressive irritation and redness of her right eye. She states that for the past 3-4 months, she has had a feeling of "sand in her right eye," as well as a burning sensation and mild photophobia. On examination, she has mild to moderate injection of her superior palpebral conjunctiva as well as her superior bulbar conjunctiva with a mild papillary reaction. She is noted to have superior conjunctivochalasis and has punctate staining of her superior bulbar conjunctiva with fluorescein exam. In addition to treating her current symptoms, what additional testing should be considered?

## Choices:

1. Liver function tests
2. CT scan of the orbits with contrast
3. Thyroid function tests
4. Corneal sensation testing

## Answer: 3 - Thyroid function tests

## Explanations:

- This clinical scenario describes superior limbic keratoconjunctivitis which often presents in the fifth to sixth decade of life, can be unilateral or bilateral and presents with burning, itching, and foreign body sensation with associated superior conjunctival injection.
- Though the etiology of superior limbic keratoconjunctivitis is not well-established, it is thought to be secondary to chronic microtrauma and often associated with redundant conjunctival tissue (conjunctivochalasis).
- Up to 30% of patients with superior limbic keratoconjunctivitis have been found to have thyroid dysfunction, so it is useful to send thyroid laboratory studies if this has not been recently done.
- Superior limbic keratoconjunctivitis is also associated with keratoconjunctivitis sicca in up to 25% of patients, and tear production testing with a Schirmer test would be useful to evaluate further.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Keratoconjunctivitis

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## Question 78: A 33-year old postpartum female presents 6 weeks after delivery with complaints of a headache and blurry vision. She complains that even though she never breastfed she has had milk production that is profuse. Her menstrual cycle has not returned, and she is worried that something is not right. The physical exam is unremarkable. Bloodwork reveals elevated prolactin levels. MRI T1 weighted images reveal a 9 mm lesion that is isodense at the base of the pituitary gland. What is the best management of this patient?

## Choices:

1. Bromocriptine
2. Radiation
3. Transsphenoidal surgery
4. Transcranial surgery

## Answer: 1 - Bromocriptine

## Explanations:

- The goal of treating any pituitary cancer is a cure. When this is not possible, one should at least decrease the mass, restore hormonal function, and ensure that normal vision is restored.
- In general, pituitary macroadenomas are treated surgically. The one exception is macroprolactinomas, which respond well to medical therapy.
- Medical therapy can decrease tumor size and improve symptoms.
- Prolactin-secreting macroadenomas are treated with dopaminergic agonists like bromocriptine and cabergoline.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Prolactinoma

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## Question 79: A 9-year-old girl is diagnosed with familial chylomicronemia syndrome (FCS) with triglyceride (TG) levels of 4200 mg/dL, eruptive xanthoma, and hepatosplenomegaly. Genetic testing for lipoprotein lipase ( LPL) deficiency did not reveal any abnormalities. Which of the following genetic causes best explains her FCS?

## Choices:

1. Deficiency of ApoCIII, apoA1, and LMF1
2. Deficiency of ApoCII, ApoA5, and LMF1
3. Deficiency of MTP, APOCIII and LDL receptor
4. Deficiency of apoA1, LMF1 or apoB100

## Answer: 2 - Deficiency of ApoCII, ApoA5, and LMF1

## Explanations:

- ApoCII is a co-factor for LPL, and its deficiency can result in severe hypertriglyceridemia (HTG).
- ApoA5 activates LPL, and its deficiency can result in severe HTG.
- LMP1 is crucial in the stabilization of LPL, and hence its deficiency can also result in severe HTG.
- However, the commonest mutation that results in FCS is LPL deficiency.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Biochemistry, Chylomicron

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## Question 80:

A 16-year-old male with type 1 diabetes presents to the clinic with early morning hyperglycemic episodes. His glucose has been between 200 and 300 mg/dL before breakfast and has required increased doses of regular insulin by sliding scale. Readings for the remainder of the day have been within normal limits for him. There have been no recent changes in his medication, activity, or diet. Continuous glucose monitoring confirms no overnight hypoglycemia, but a significant rise in glucose levels in the early morning hours. Which of the following mechanisms is most likely responsible for poor glycemic control of this type?

## Choices:

1. Somogyi effect
2. Nocturnal spike in growth hormone levels
3. Glucagon-like peptide 1 deficiency
4. Insulin resistance

## Answer: 2 - Nocturnal spike in growth hormone levels

## Explanations:

- Growth hormone levels spike typically in the early morning hours (between 2 and 8 am). Growth hormone antagonizes insulin, thereby encouraging hyperglycemia. This is called the "dawn phenomenon" which occurs in type 1 diabetes patients, whose exogenous insulin might also be waning at this time.
- Patients with diabetes mellitus are unable to secrete an additional surge of insulin to counteract the resultant hyperglycemia, and the dawn phenomenon occurs.
- The Somogyi effect has been discredited. It stated that hypoglycemia can cause rebound hyperglycemia as a result of the body's response to stress.
- The most effective control of these excursions of hyperglycemia has been obtained by the use of continuous insulin infusion. This gives the patient with diabetes mellitus the ability to respond in real-time to the onset of hyperglycemia. Caution to avoid overnight hypoglycemic episodes must be employed when using the continuous infusion method.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Dawn Phenomenon

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## Question 81:

A 62-year-old man has a syndrome characterized by severe gastric abdominal pain, dyspepsia, recurrent peptic ulcer disease, and diarrhea. The patient's serum gastrin level is 10 times higher than the normal upper limit. Computed tomography shows 1 cm pancreatic mass with the presence of enlarged peri-pancreatic lymph nodes and liver metastases, suggesting malignancy. Which drug should be used as a part of treating this patient's suspected condition?

## Choices:

1. Bismuth subsalicylate
2. Metronidazole
3. Famotidine
4. Omeprazole

## Answer: 4 - Omeprazole

## Explanations:

- The goal of medical management of gastrinoma is to treat the symptoms and to prevent complications from peptic ulcer disease. The preferred medical therapy is the use of high-dose proton pump inhibitors (PPI) such as omeprazole.
- PPIs are preferred over H2 receptor blockers due to their higher potency and longer duration of action.
- Conservative treatment with PPIs also is recommended for patients who are unsuitable for surgery or patients with widespread metastasis.
- In about 50% of individuals, ulcer healing can occur within 4 weeks, and most people find symptom relief, including resolution of diarrhea.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Gastrinoma

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## Question 82: A 76-year-old male with a past medical history of hyperthyroidism secondary to multifocal toxic goiter presents to your clinic for a routine visit. The patient's hyperthyroidism has failed treatment with propylthiouracil. After discussion, the patient inquires about surgical treatment options. What is the most common sequela of the necessary surgical procedure?

## Choices:

1. Persistent hyperthyroidism
2. Hypothyroidism
3. Vocal cord paralysis
4. Perioperative death

## Answer: 2 - Hypothyroidism

## Explanations:

- The most common complication of subtotal thyroidectomy is hypothyroidism. Removal of thyroid gland tissue results in an expected hypothyroidism due to the lack of T4 (thyroxine) hormone secretion.
- The decreased levels of T4 affects the feedback loop and leads to an increased secretion of thyroid stimulating hormone (TSH). TSH can be used to monitor a patient's thyroid function status post subtotal thyroidectomy, although it may take weeks for TSH levels to equilibrate.
- The second most common complication of subtotal thyroidectomy is persistent hypoparathyroidism. The parathyroid glands are located adjacent to the thyroid gland, and thus, removal of the thyroid can result in removal of the parathyroid glands.
- Vocal cord paralysis is a potential risk for patients undergoing subtotal thyroidectomy due to the potential for iatrogenic recurrent laryngeal nerve injury. The incidence of such injury, however, is considerably less than the incidence of hypothyroidism.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hyperthyroidism

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## Question 83: A 49-year-old female presents to the clinic for a weight loss surgery discussion. She has a BMI of 45 and wants to discuss the choices for the types of procedures and associated percentage weight loss with each type. Which of the following best matches a surgery with its associated expected total weight loss at one year?

## Choices:

1. Gastric band; 20%
2. Sleeve gastrectomy; 20%
3. Roux-en-Y; 34%
4. Biliopancreatic diversion; 25%

## Answer: 3 - Roux-en-Y; 34%

## Explanations:

- Roux en-Y gastric bypass is currently in practice and is offered to bariatric surgery patients after explaining the risk and benefits of the procedure.
- Typically after Roux-en-Y gastric bypass, patients lose 30 to 35% of their total body weight.
- The transit of food bypassing the proximal small bowel makes this a malabsorptive procedure, leading to less time and surface area for the bowel to absorb.
- Gastric band is one of the popular bariatric procedures which is still currently used by many bariatric surgeons. Typically after a gastric band procedure, the patient loses about 14% of the total body weight postoperatively. Sleeve gastrectomy is currently the most popular bariatric procedure in practice. Patients typically lose 25 to 30% of total body weight postoperatively. Biliopancreatic diversion leads to about 40% of total body loss.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Post-Op Assessment and Management Of Obesity Surgery

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## Question 84: A 50-year-old African American female who is obese has hypertension, coronary artery disease, and diabetes mellitus. She visits her primary care provider's office with complaints of frequent episodes of profuse diaphoresis and fatigue. Her blood glucose levels during these episodes are between 40 and 60 mg/dL. She recently received some advice from her friend and decided to start a ketogenic diet to lose weight, as it helped her friend lose 30 pounds. She reports strict compliance with her medications, diet, and fluid intake. Her vital signs and physical exam in the office are unremarkable. What is the most likely explanation why this patient is not having adrenergic symptoms?

## Choices:

1. Treatment with beta-blockers
2. High tolerance for low blood sugars
3. False blood glucose readings
4. Dehydration

## Answer: 1 - Treatment with beta-blockers

## Explanations:

- A ketogenic diet typically drops blood glucose levels. This is not a concern in patients without diabetes mellitus, as glucose levels are well regulated. However, patients with diabetes mellitus who already have impaired blood glucose regulation, especially on medications, tend to develop symptomatic hypoglycemia. Hypoglycemia typically results in adrenergic symptoms. Given the patient's history of hypertension and coronary artery disease, this patient is most likely on beta-blocker therapy. Beta-blockers mask all beta-adrenergic symptoms except sweating which is alpha-mediated. Therefore, only sweating is noted, and all other hypoglycemia symptoms are masked.
- Typically patients with diabetes mellitus are very sensitive to hypoglycemia. It is very unlikely this patient is tolerant to low blood glucose levels.
- Consistently low blood glucose levels, especially with relevant history, are unlikely.
- There is no suggestion of clinical dehydration from the history or exam. The patient's blood pressure is stable, and she reports medication adherence and appropriate diet and fluid intake.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Ketogenic Diet

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## Question 85: A 30-year-old female presents with weakness, weight loss, heart palpitations, and nervousness. Physical examination shows a restless woman with warm, moist skin, and a resting pulse rate of 110 beats/min. The neck exam reveals a diffusely enlarged thyroid. Her skin has an orange peel color and texture in the pretibial areas, and onycholysis is noted in her fifth fingernail bilaterally. Which of the following would likely be seen in the suspected disorder?

## Choices:

1. Low thyroid stimulating hormone (TSH), elevated T4 and T3, and normal radioactive iodine uptake
2. High TSH, elevated T4 and T3, and increased radioactive iodine uptake
3. Low TSH, elevated T4 and T3, and increased radioactive iodine uptake
4. High TSH, decreased T3 and T4, and reduced radioactive iodine uptake

## Answer: 3 - Low TSH, elevated T4 and T3, and increased radioactive iodine uptake

## Explanations:

- Graves disease is the most frequent cause of hyperthyroidism.
- Graves disease is characterized by thyrotoxicosis with elevated thyroid hormones, clinical features of thyroid hormone excess, and hyperthyroidism.
- Laboratory tests in Graves disease will show elevation in T4 and T3 and a corresponding decrease in thyroid stimulating hormone (TSH). This is because of the negative feedback relationship between the TSH and the thyroid gland.
- A radioactive iodine scan will show an increased uptake of labeled iodine. Follicular cells are responsible for the uptake. The increased uptake allows differentiating Graves disease from other causes of thyrotoxicosis such as Hashitoxicosis, subacute thyroiditis, and factitious thyrotoxicosis. The latter conditions would cause decreased uptake.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Graves Disease

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## Question 86:

A 47-year-old female is being treated for diabetes mellitus. She was diagnosed at age 41 and was started on oral hypoglycemic agents. After eight months, her glycemic control deteriorated, and insulin was begun as she tested positive for glutamic acid decarboxylase antibody (GADA). Her present complaint is a burning pain in both feet that sometimes keeps her awake at night. Her BMI is 24 kg/m2, and her blood pressure is 130/84 mmHg. There is no pallor; the heart, lungs, and abdominal examinations are normal. Neurological examination reveals mild hyperaesthesia over the dorsum of both feet but no motor deficits or other abnormalities. Her HbA1C is 9.5 percent. Which of the following tests is useful in accurately diagnosing this patient's current complaint?

## Choices:

1. Testing for vibration sense in the feet using a 128-hertz tuning fork
2. Testing for intraepidermal nerve fiber density (IENFD)
3. Testing for vibration perception threshold (VPT)
4. Nerve conduction studies (NCS)

## Answer: 2 - Testing for intraepidermal nerve fiber density (IENFD)

## Explanations:

- This patient has latent autoimmune diabetes of adults (LADA), the onset of the disease after age 35, BMI of less than 25 kg/m2, and insulin independence for at least six months after diagnosis. She has diabetic sensory neuropathy as evidenced by symptoms of burning pain in her feet in a symmetrical pattern and hyperaesthesia on clinical exam, most likely due to small-fiber involvement, which is characteristic of LADA.
- Small fiber neuropathy (SFN) is often the earliest neuropathic complication in LADA and occurs before other larger fibers carrying other sensations are involved. It occurs more frequently in LADA than in type 2 diabetes (T2DM), whereas large fiber neuropathy occurs with equal frequency in both conditions.
- Tests for SFN include intraepidermal nerve fiber density (IENFD) in skin biopsy from the dorsum of the foot, cold and warm perception thresholds, and corneal confocal density (CCD). SFN, if diagnosed and treated early by achieving excellent glycemic control, can be reversed.
- NCS is not sensitive enough to diagnose SFN; vibration testing detects abnormalities in large nerve fibers.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Latent Autoimmune Diabetes

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## Question 87:

A 4-year-old girl is brought to the clinic with a complaint of vaginal bleeding. She has had bloody vaginal discharge for the past 24 hours. There is no history of trauma or exposure to estrogen creams. A review of the systems is positive for bony pains in the lower extremities. On physical examination, she has cafe au lait macules on her lower back that do not cross the midline. Breast development is at SMR 2. Genital examination reveals pubic hair SMR 3 and bloody vaginal discharge with no associated foul smell. There are no focal deficits on the neurologic exam. Precocious puberty is suspected, and further hormonal testing confirms it. Which of the following additional findings is most likely to be found?

## Choices:

1. Mass in the third ventricle on MRI
2. Hypernatremia
3. Decreased calcium levels
4. Decreased TSH levels

## Answer: 4 - Decreased TSH levels

## Explanations:

- The clinical triad of irregular cafe au lait macules, fibrous dysplasia of the bones (bony pains), and peripheral precocious puberty is indicative of McCune Albright syndrome. Vaginal bleeding usually precedes breast development.
- This is a sporadic condition attributed to a mutation of the GNAS gene on chromosome 20. These mutations of the alpha subunit of the G stimulatory protein (Gs) activate adenylyl cyclase.
- This results in autonomous activation of the other endocrine pathways. The most common ones include hyperthyroidism, hyperprolactinemia, increased growth hormone, cortisol excess, and hypophosphatemia.
- This condition is not associated with brain lesions, so MRI would generally not be necessary. It is not associated with diabetes insipidus, so hypernatremia is unlikely. There are no parathyroid abnormalities or associated hypocalcemia.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Precocious Puberty

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## Question 88:

A 15-year-old male is brought to the clinic by his mother. She states that she is worried about her son because he has not started puberty like the other boys in his school. The patient additionally states that he has always had trouble smelling. Upon physical exam, he lacks secondary sexual characteristics and has atrophic testicles. Which of the following is most likely to be seen on his lab workup?

## Choices:

1. Decreased GnRH, decreased FSH, increased testosterone
2. Decreased GnRH, decreased FSH, decreased testosterone
3. Increased GnRH, increased FSH, increased testosterone
4. Increased GnRH, decreased FSH, decreased testosterone

## Answer: 2 - Decreased GnRH, decreased FSH, decreased testosterone

## Explanations:

- Gonadotropin-releasing hormone (GnRH) is normally produced by the hypothalamus and acts on the gonadotrophs of the anterior pituitary.
- Gonadotroph cells are present within the pituitary and are responsible for secreting gonadotropins, including luteinizing hormone and follicle-stimulating hormone.
- This patient has Kallmann syndrome, which is a form of hypogonadotropic hypogonadism.
- Kallmann syndrome can be distinguished from other forms of hypogonadotropic hypogonadism by a diminished (hyposmia) or absent (anosmia) sense of smell. Additionally, patients will have a micropenis and will lack secondary sexual characteristics such as coarse pubic hair.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Physiology, Gonadotropin-Releasing Hormone

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## Question 89:

A 27-year-old man comes to the clinic for evaluation after having been unable to conceive with his wife. His testes are normal in size, shape, and consistency. No gynecomastia and other physical abnormalities are seen on physical examination. His Y chromosome shows microdeletions in the Yq11 region and the diagnosis of Sertoli cell-only syndrome is established. Which of the following findings will most likely correspond to the patient's diagnosis?

## Choices:

1. High luteinizing hormone (LH), normal testosterone, low-level inhibin-B, high follicle-stimulating hormone (FSH)
2. Normal luteinizing hormone (LH), low-level testosterone, low-level inhibin-B, low-level follicle-stimulating hormone (FSH)
3. Normal luteinizing hormone (LH), normal testosterone, low-level inhibin-B, normal follicle-stimulating hormone (FSH)
4. Normal luteinizing hormone (LH), normal testosterone, low-level inhibin-B, high follicle-stimulating hormone (FSH)

## Answer: 4 - Normal luteinizing hormone (LH), normal testosterone, low-level inhibin-B, high follicle-stimulating hormone (FSH)

## Explanations:

- Sertoli cells are important for proper growth and development of spermatogonia. They secrete anti-Mullerian hormone in males that prevents the development of female reproductive organs.
- Sertoli cells secrete inhibin-B. It down-regulates the level of follicle-stimulating hormone secretion (FSH). Activin, which is also released by Sertoli cells, increases the level of FSH.
- Most patients with Sertoli cell-only syndrome have an initial complaint of infertility and should be further evaluated by conducting a semen analysis. Azoospermia is a common finding and only a very small percentage of patients may still have a low detectable level of sperm.
- Physical examination of Sertoli cell-only syndrome patients can show normal or smaller in size testes with normal consistency and shape. Some patients have been reported to show atrophy of the testes.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Sertoli-Cell-Only Syndrome

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## Question 90: A 55-year-old female presents with hypercalcemia and is found to have an elevated parathyroid hormone level. Parathyroid disease is suspected and imaging is done. With regard to parathyroid imaging with technetium-99m-sestamibi, which of the following statements is true of the 2 to 3 hour delayed images?

## Choices:

1. Thyroid activity persists, but parathyroid activity shows complete washout except for hyperactive adenoma
2. Parathyroid adenoma activity persists, but normal thyroid activity fades
3. Hyperfunctioning thyroid activity persists, and there is no activity in parathyroid
4. Normal parathyroid glands are routinely visualized

## Answer: 2 - Parathyroid adenoma activity persists, but normal thyroid activity fades

## Explanations:

- Usually, parathyroid adenomas and normal thyroid are both seen on early images. However, on delayed images, the thyroid washes out, and the parathyroid adenoma remains active.
- Sestamibi is lipophilic and sequestered in the mitochondria. Parathyroid adenomas have a greater number of mitochondria than thyroid tissue, which accounts for their persistent visualization on delayed images.
- Hyperfunctioning thyroid foci can remain active on delayed images, a potential false positive.
- Normal parathyroid activity is too scant to be routinely seen on nuclear scans, even on delayed images. Therefore, normal parathyroid glands will not interfere with imaging as false-positive findings.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Parathyroid Adenoma

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## Question 91:

A 45-year-old male was diagnosed with insulinoma and underwent surgical resection. At 6-month post resection follow up, he was found to have the recurrence of the tumor on imaging studies. He was started on diazoxide but remained symptomatic with hypoglycemic episodes. Diazoxide was then switched to octreotide by his endocrinologist. He now presents again with recurrent symptoms of diaphoresis, palpitations, and blurry vision. His insulinoma size is also growing on repeat imaging. Which of the following is the next best step in the management of this patient?

## Choices:

1. Adjusting the dose of octreotide
2. Surgical resection
3. Everolimus
4. Radiation

## Answer: 3 - Everolimus

## Explanations:

- This patient already underwent surgical resection and still had recurrent symptoms while on diazoxide or octreotide. He was also found to have increased tumor volume on repeat imagings. For this group of patient, targeted therapy (everolimus or sunitinib) should be offered given its survival benefits.
- Everolimus is an inhibitor of the mammalian target of rapamycin.
- Everolimus was found to improve median PFS in patients with low or intermediate-grade, advanced, progressive pNET and in a subgroup of functional pNET (including but not limited to insulinomas).
- It also controls hypoglycemia in patients with malignant insulinomas.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Insulinoma

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## Question 92:

A 5-year-old boy is brought to the clinic due to concerns of early sexual development. Three months ago, the mother first noticed pubic hair along with the enlargement of the penis. She reports that the pubic hair continued to increase along with the development of body odor. A review of the growth charts reveals accelerated linear growth. On examination of his genitalia, pubic hair is at SMR 3, and the phallus is of the adult size. Testes are palpated bilaterally measuring about 9 ml. GnRH agonist stimulation test confirms precocious puberty. What is the next appropriate test in this patient?

## Choices:

1. Ultrasonography of the scrotum
2. Magnetic resonance imaging of the brain
3. CT scan of the abdomen
4. DHEA-S levels

## Answer: 2 - Magnetic resonance imaging of the brain

## Explanations:

- The boy in this vignette is experiencing precocious puberty evidenced by increased testicular volume (pre-pubertal volume is 4 ml), accelerated growth velocity along with secondary sexual characteristics (pubic hair and body odor). GnRH agonist testing is the gold standard for confirming central precocious puberty.
- After establishing the diagnosis, it is important to identify the etiology. While the causes of central precocious puberty (CPP) in girls are idiopathic, boys usually have a pathology which includes brain lesions, infections, trauma, and genetic mutations.
- So the next best step in this boy would be to rule out a brain lesion by performing a magnetic resonance imaging of the brain.
- Ultrasonography of the scrotum would be beneficial in peripheral precocious puberty when suspecting for testicular tumors. CT scan of the abdomen would be useful to identify hCG secreting tumors or adrenal tumors. DHEA-S levels are helpful in differentiating central causes from peripheral causes.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Precocious Puberty

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## Question 93:

A 12-year-old female with a medical history of cystic fibrosis presents to the emergency room with dyspnea. She reports a 10 lbs weight loss over the last 3 weeks with concurrent symptoms of polydipsia and polyuria. Basic metabolic panel obtained in the emergency room showed a sodium of 133 mmol/L, potassium of 4.5 mEq/L, chloride of 110 mEq/L, bicarbonate of 15 mEq/L, BUN 14 mg/dL, creatinine 0.62 mg/dL, and plasma glucose of 250 mg/dL. Urine analysis is significant for the presence of glucose and large ketones. What is the most appropriate next step in the management of this patient?

## Choices:

1. Obtain a 2-hr 75 g oral glucose tolerance test
2. Start insulin therapy
3. Obtain autoantibodies for islet cell antibody (ICA) and glutamic acid decarboxylase antibody (GAD65)
4. Start metformin 500 mg twice a day

## Answer: 2 - Start insulin therapy

## Explanations:

- She has cystic fibrosis and diabetes mellitus type 1, not cystic fibrosis-related diabetes. She presents in diabetic ketoacidosis that requires immediate treatment to resolve her acidosis.
- Unlike type 1 diabetes, individuals with cystic fibrosis-related diabetes normally maintain some degree of insulin function that protects them from developing ketoacidosis. The presentation of diabetic ketoacidosis is rare in cystic fibrosis-related diabetes. Anyone with cystic fibrosis that presents with diabetic ketoacidosis should be treated as type 1 diabetes until proven otherwise.
- Cystic fibrosis-related diabetes has an insidious presentation of symptoms over the course of years compared to type 1 diabetes that generally presents more acutely over weeks to months.
- The destruction of pancreatic cells that occur in cystic fibrosis-related diabetes is independent of any autoantibodies. Diabetes autoantibodies are generally negative in cystic fibrosis-related diabetes, and the presence of autoantibody firms the diagnosis of cystic fibrosis with type 1 diabetes.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Cystic Fibrosis Related Diabetes

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## Question 94: Heterozygous familial hyperlipidemia (HeFH) is one of the most common genetic disorders, occurring in approximately one in 200 to 500 people. Homozygous FH (HoFH) has a prevalence of one in 160,000 to 500,000 people. Identify the incorrect statement.

## Choices:

1. LDL-C apheresis as an adjunct to diet and maximally tolerated drug therapy is a useful therapeutic modality in HoFH
2. Statins are equally effective in both homozygous FH as well as in heterozygous FH
3. FDA approved indications for LDL-C apheresis are LDL-C greater than 300 mg/dL on maximally tolerated therapy, and in the presence of coronary artery disease, LDL-C greater than 200 mg/dL on maximally tolerated therapy
4. Additional options for patients with HoFH include the microsomal triglyceride transfer protein (MTP) inhibitor, lomitapide, and the apoB antisense oligonucleotide (ASO), mipomersen

Answer: 2 - Statins are equally effective in both homozygous FH as well as in heterozygous FH

## Explanations:

- Statins are first-line drugs for management of familial hyperlipidemia but may be ineffective in HoFH as they are dependent on increasing LDLR expression for LDL-C lowering.
- Normal number and function of LDL receptors in the liver is important for the uptake of LDL cholesterol. Receptor-negative FH patients have less than 2%, and receptor-defective patients have about 2 to 25% of normal LDLR activity.
- HoFH is less responsive to drug therapy than HeFH. Thus LDL-C apheresis (LA) has been developed as a primary management strategy.
- Additional options for patients with HoFH include the microsomal triglyceride transfer protein (MTP) inhibitor, lomitapide, and the apoB antisense oligonucleotide (ASO), mipomersen, especially when LA is not available. Due to their mechanism of action, these drugs do not depend on LDLR expression for LDL-C lowering.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Familial Hypercholesterolemia, Type 2A

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## Question 95: A 56-year-old female presents to the office with a chief complaint of high blood pressure. She has a medical history of type 2 diabetes mellitus type, hypertension, obesity, and myocardial infarction status post stent placement 10 years ago. Her current medications are metformin, aspirin, lisinopril, and metoprolol. Her family history is significant for hypertension and cerebral vascular accident. Her mother had her stroke at age 66, and her father developed hypertension at age 50. Her blood pressure today is 155/79 mmHg in the office. Her recent basal metabolic profile shows potassium of 4.2 mmol/l. Per the 2016 Endocrine Society guidelines, should the patient be screened for primary aldosteronism?

## Choices:

1. Yes, the patient has resistant hypertension and a family history of cerebral vascular accident
2. Yes, the patient has resistant hypertension and likely obstructive sleep apnea
3. No, the patient does not have a significant family history for cerebral vascular accident and does not qualify for resistant hypertension
4. No, does not have hypokalemia on recent lab work

## Answer: 3 - No, the patient does not have a significant family history for cerebral vascular accident and does not qualify for resistant hypertension

## Explanations:

- The patient does not have drug-resistant hypertension, which is defined as a 3 drug regimen. The patient's family members also did not have early-onset hypertension or early diagnosis of cerebral vascular accident (CVA). This patient would need to adjust lifestyle, add another antihypertensive, and optimize diabetic treatment.
- Although it is recommended for patients with hypertension and sleep apnea to be screened, this patient does not exhibit the classic symptoms of obstructive sleep apnea (OSA), and it cannot be assumed that she has OSA given her obesity. The patient also does not have drug-resistant hypertension as defined by the 2016 Endocrine Society Guidelines.
- Per 2016 Endocrine Society Guidelines patients with hypertension and low dose diuretic hypokalemia, severe hypertension (on 3 medications), hypertension with adrenal incidentaloma, hypertension with sleep apnea, hypertension and family history of early-onset CVA or hypertension (less than 40 years old), and patients with known first degree relatives with primary aldosteronism should be screened.
- Patients do not necessarily need to have hypokalemia to be diagnosed with primary aldosteronism. This patient does not have maximal drug therapy and resistant hypertension and no significant family history per the 2016 Endocrine Society Guidelines.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Primary Hyperaldosteronism

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## Question 96:

A 47-year-old female for further evaluation of hypercalcemia found on routine lab work. Her serum calcium is 10.8 mg/dL, her urine calcium is 375 mg/day, and her lowest T score from a recent DEXA scan is -2. Which of the following is an indication for parathyroidectomy in this patient?

## Choices:

1. Serum calcium level
2. Score on DEXA scan
3. Urine calcium excretion
4. Age

## Answer: 4 - Age

## Explanations:

- The following are indications for parathyroidectomy in asymptomatic disease; serum calcium 1.0 mg/dL above the upper limit of normal, 24-hour urinary calcium greater than 400 mg, creatinine clearance reduced by 30%, bone mineral density T score less than -2.5 SD at any site, or age less than 50 years.
- Parathyroid hormone plays a vital role in calcium and phosphorus metabolism by acting in the kidneys, intestine, and bone. Normally secreted in response to low blood calcium, parathyroid hormone (PTH) works to increase calcium absorption in the distal tubules and inhibit phosphate resorption. It also increases body calcium by indirectly stimulating osteoclasts, which results in bone resorption. Finally, PTH enhances intestinal absorption of calcium by increasing the activation of vitamin D.
- Surgical intervention is indicated in any patient with symptomatic hyperparathyroidism, manifested by renal, gastrointestinal, or neuromuscular dysfunction.
- Patients with parathyroid carcinoma also have hypercalcemia, but it tends to be to a higher degree than in primary hyperparathyroidism due to a benign adenoma. If the calcium level is greater than 14 mg/dL, it is highly indicative of a malignant process rather than benign adenoma.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Parathyroid Minimally Invasive Surgery

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## Question 97: A 14-year-old female with a past medical history of cystic fibrosis presents for a routine outpatient visit. She was recently hospitalized one month ago for an acute illness. During that hospitalization, she was found to have a one-time fasting plasma glucose of 130 mg/dl. She reports baseline health without any symptoms of weight loss, polyuria, or polydipsia. Which of the following is the most appropriate next step in the management of this patient?

## Choices:

1. Start a long-acting basal insulin
2. Start rapid-acting pre-meal insulin
3. Obtain a Hemoglobin A1c level
4. Obtain a 2 hour 75-gram oral glucose tolerance test

## Answer: 4 - Obtain a 2 hour 75-gram oral glucose tolerance test

## Explanations:

- A 2-hour 75 g oral glucose tolerance test is the only acceptable screening test for cystic fibrosis related-diabetes.
- At baseline health, the diagnosis of cystic fibrosis-related diabetes can be made with a 2-hour oral glucose tolerance plasma glucose level of greater than or equal to 200 mg/dl, fasting plasma glucose of greater than or equal to 126mg/dl, HgA1c level of greater than or equal to 6.5%, and/or random glucose greater than or equal to 200 mg/dl with clinical symptoms.
- To make the diagnosis of cystic fibrosis-related diabetes during an acute illness requires a 2-hour postprandial plasma glucose level greater than or equal to mg/dl or a fasting plasma glucose of greater than or equal to 126mg/dl that persist for 48 hours.
- HbA1c levels may be falsely low in individuals with cystic fibrosis, and a normal hemoglobin A1c level does not rule out cystic fibrosis-related diabetes.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Cystic Fibrosis Related Diabetes

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 98:

A 38-year-old female presents to the clinician with complaints of feeling excessively hot over the past couple of days. She also states that she is feeling more irritated than usual and has difficulty sleeping. She adds that she feels like her heart is "beating faster than normal." On further evaluation, she reveals that she had a cold two weeks ago, which has resolved except for a sore throat. On physical examination, a tender thyroid gland is palpated. What lab abnormality would her laboratory work up reveal?

## Choices:

1. Elevated thyroid-stimulating hormone
2. Elevated erythrocyte sedimentation rate and C-reactive protein
3. Increased uptake with radioactive iodine uptake scan
4. Positive thyroid peroxidase antibodies

## Answer: 2 - Elevated erythrocyte sedimentation rate and C-reactive protein

## Explanations:

- This patient is presenting with signs and symptoms of hyperthyroidism from likely subacute thyroiditis caused by a viral illness. This is a common cause of hypothyroidism. Although it causes hypothyroidism, a transient period of hyperthyroidism persists at the beginning of the disease.
- As this patient has an inflammatory etiology of thyroid disease, nonspecific inflammatory markers such as erythrocyte sedimentation rate and C-reactive protein are expected to be elevated.
- Although this patient is presenting as hyperthyroidism, her radioactive iodine uptake scan is going to be decreased because there is no excess secretion of thyroid hormone. It is simply a post-viral sequela.
- It is important to work up a patient like this adequately. With any patient that has a thyroid complaint, the first tests to order are a thyroid-stimulating hormone and ultrasound. They are inexpensive, noninvasive, and can help guide one towards making a diagnosis.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Thyroiditis

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 99: A 43-year-old female is diagnosed with Graves disease. She also has a small goiter. Her symptoms are not deemed to be severe, and propylthiouracil is prescribed. What is the most serious potential adverse effect of this medication?

## Choices:

1. Hypocalcemia
2. Agranulocytosis
3. Renal failure
4. Hematuria

## Answer: 2 - Agranulocytosis

## Explanations:

- Agranulocytosis is the most serious possible adverse effect of propylthiouracil use, possibly leading to liver failure and death.
- Agranulocytosis is a severe reduction in white blood cell count, most commonly neutrophils. Signs and symptoms of agranulocytosis include those related to infectious lesions of the throat, the gastrointestinal tract, and skin.
- In 2009 the FDA issued a warning about serious liver injury with the use of propylthiouracil.
- Propylthiouracil normally is well tolerated. The most common adverse effects are rash, itching, hives, abnormal hair loss, and skin pigmentation. Other common adverse effects are swelling, nausea, vomiting, heartburn, loss of taste, joint and muscle aches, numbness and headache, allergic reactions, and hair whitening. Thrombocytopenia can occur.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Propylthiouracil (PTU)

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## Question 100: A patient has had several episodes of syncope preceded by blurred vision, profuse sweating, and lethargy. Blood tests reveal hypoglycemia and ultrasound shows a mass in the mid-epigastrium. What is the most likely diagnosis?

## Choices:

1. Metastatic brain cancer
2. Insulinoma
3. Type 1 diabetes mellitus
4. Pheochromocytoma

## Answer: 2 - Insulinoma

## Explanations:

- About 85% of patients with an insulinoma present with diplopia, blurred vision, palpitations, or weakness.
- Other symptoms of insulinoma include confusion, abnormal behavior, unconsciousness, and amnesia. About 12% of patients have grand mal seizures.
- Laboratory results will reveal high insulin, low glucose, and high levels of C peptide and proinsulin.
- In patients with an insulinoma, diazoxide is used to decrease insulin secretion, and somatostatin analogs are used to prevent hypoglycemia.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Insulinoma

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## Section 2

Question 101: A 17-year-old girl presents to a clinic for the evaluation of weight gain. She denies overeating but loves soft drinks, watches television 3-6 hours per night, and is active only in gym class at school. Her history is remarkable for infrequent dysphagias and easy fatiguability. The family history is positive for obesity and type 2 diabetes mellitus. She is not on any medications at present. Her menses are irregular, and the remainder of the review of systems is negative. On physical examination, her height is 149 cm (5th percentile), and her body mass index (BMI) is 40 (>95th percentile). She has a heart rate of 66 bpm and blood pressure of 110/70 mmHg. Her obesity is generalized with no evident masses. Her thyroid is not palpable. She has completed puberty, and the remainder of the examination is normal. After ruling out diabetes, what is the next best step in the management?

## Choices:

1. Cortisol level test
2. Thyroid function tests
3. Random lipid profile test
4. Leptin level test

## Answer: 2 - Thyroid function tests

## Explanations:

- Almost all cases of ectopic thyroid are hypothyroid. Most of the findings in the scenario are indicating the hypothyroid state. The possibility of the ectopic thyroid should be at the top of the differential diagnosis because of the symptoms such as dysphagia, easy fatiguability, short stature, and an increase in weight, which is not related to the food intake are suggestive of a hypothyroid state.
- Hyperthyroidism is extremely rare and is found only in two reported cases of ectopic thyroid.
- The newborn screening can show abnormal tests in the majority of the cases of ectopic thyroid.
- Lifelong thyroxine is the definitive treatment in all symptomatic patients.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Ectopic Thyroid

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## Question 102:

A 70-year-old female presents after a ground level fall resulting in a femur fracture. She was diagnosed with ostoporosis 3 years ago after a bone density scan. She has been on alendronate for the last 3 years and is compliant with therapy. Her vitamin D levels are normal, and she takes calcium and vitamin D daily. She continues to smoke and has been advised to quit. Her body mass index is below normal. What should be recommended?

## Choices:

1. Continue alendronate
2. Stop alendronate and start intravenous zoledronic acid
3. Stop alendronate and start denosumab
4. Increase calcium and vitamin D supplements

## Answer: 3 - Stop alendronate and start denosumab

## Explanations:

- Her fracture reveals that she has failed alendronate and should be started on another osteoporosis medication with a different mechanism of action.
- In this patient, bisphosphonates should be discontinued due to failure. Denosumab should be started. It is a humanized monoclonal antibody directed against the receptor activator of the nuclear factor-kappa B ligand.
- Denosumab is indicated for postmenopausal females with osteoporosis who are at high risk of fracture. High risk includes a history of osteoporotic fracture, multiple risk factors for fracture, intolerance to other osteoporosis therapies, or failure of other osteoporosis therapies.
- Dual-energy x-ray absorptiometry scans are most useful in diagnosis. Their utility in following treatment has not been determined. In this patient with a fragility fracture, an improved T-score would not be useful in determining treatment because her fracture demonstrates a clear failure of alendronate therapy.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Osteoporosis

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## Question 103: A 40-year-old male presents with symptoms of weight gain, myalgia, and swollen extremities. His labs showed a thyroid stimulating hormone (TSH) of 107.6 IU/ml, unmeasurable free thyroxine (T4). Exam shows hypertrophy of extremities. His creatinine is at 0.89 mg/dL and electrolytes were within normal limits. What is the best initial treatment of this patient?

## Choices:

1. High dose corticosteroids
2. Low dose corticosteroids
3. NSAIDs and warm compresses
4. Levothyroxine

## Answer: 4 - Levothyroxine

## Explanations:

- This patient has uncontrolled hypothyroidism and hypothyroid myopathy.
- The best initial treatment for hypothyroid myopathy is levothyroxine.
- There is no indication for corticosteroids and NSAIDs in the management of hypothyroid myopathy.
- Hypothyroid myopathy can take up to 6 months to resolve even if hypothyroidism is corrected rapidly.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hypothyroid Myopathy

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## Question 104:

An 18-year-old female patient is admitted to the hospital with refractory nausea and vomiting. About three days ago she had an upper respiratory tract infection and has been progressively worse since. History is significant for amenorrhea, repeated candida infections of the oral cavity, and debilitating cramps of her hands. Heart rate is 110/min, respiratory rate 18/min, temperature 99.6 F, and blood pressure 90/58 mmHg. On physical exam, she is noted to have hyperpigmentation of the knuckles, the absence of axillary hair, and white patches in the oral cavity. What is the next best step in the management of this patient?

## Choices:

1. Obtain plasma ACTH and cortisol at 8 AM
2. Obtain MRI of the pituitary gland
3. Obtain CT scan of the adrenal glands
4. Start stress doses of hydrocortisone

## Answer: 4 - Start stress doses of hydrocortisone

## Explanations:

- Plasma and cortisol can be drawn at the time patient is being evaluated in the emergency department or the hospital prior given the first shot of high dose corticosteroids, but given patient is acutely ill, waiting until 8 am to give steroids is not appropriate. Very high levels of ACTH may be seen in patients.
- Based on the clinical presentation the patient most likely has primary adrenal insufficiency, there is no need to obtain an MRI of the pituitary at this time.
- Imaging of the adrenals at this time is not needed given she can be diagnosed clinically and biochemically first. Furthermore, this would delay treatment and will not likely establish the diagnosis.
- Adrenal insufficiency can present with fatigue, abdominal pain, nausea, vomiting, and dizziness. Adrenal crisis is treated by starting stress dose hydrocortisone which results in marked improvement of the patient's status. A history of chronic candidiasis and hypocalcemia as evidenced by cramps in her hands indicate a diagnosis of APS-1.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Polyglandular Autoimmune Syndrome Type I

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## Question 105:

A 60-year-old female was found in a semi-comatose condition and brought to the emergency department. On physical exam, her height was 66 inches (167.6 cm), and her weight was 123 lb (55.8 kg) (BMI=19.9 kg/m2). Her blood pressure was 80/40 mm; her pulse rate was 50 beats/min with a temperature of 32 C (89.6 F). She was disoriented and lethargic. There was no palpable thyroid enlargement, but there was a scar on her neck. Laboratory test results demonstrate: hemoglobin 9 g/dl; hematocrit 25%; WBC count 9840 cells/mm3; platelet count 297,000 cells/mm3; creatinine 1.09 mg/dl sodium 126 meq/l; potassium 3.8 mEq/L; chloride 93 mEq/L; and bicarbonate 24.5 mEq/L. Chest radiography and CT brain didn't reveal any abnormalities. Blood and urine cultures were sent. What is the least accurate statement regarding hyponatremia in this patient?

## Choices:

1. Hyponatremia is due to increase in antidiuretic hormone
2. There is a decreased water transport to the distal nephron
3. There is increase urinary sodium excretion
4. The patient has hypervolemic hyponatremia

## Answer: 4 - The patient has hypervolemic hyponatremia

## Explanations:

- The patient has myxedema coma given the presentation of hyponatremia, bradycardia, hypothermia, and hypotension. Patients with hypothyroidism and myxedema coma present with euvolemic hyponatremia due to decreased water transport to the distal nephron, an increase in antidiuretic hormone (ADH) and increase urinary sodium excretion.
- The patient requires fluid resuscitation given the hypotension. A balance between fluid restriction and the need for fluids must be met to avoid overcorrection of the serum sodium level and osmotic demyelination syndrome.
- Hyponatremia is also a critical factor in the patient's altered mental status and development of coma. Urinary osmolality is elevated in relation to plasma osmolality. Patients may also have bladder atony causing urinary retention
- In patients with severe hyponatremia (120 mmol/L) and myxedema coma, careful administration of 3% sodium chloride along with intravenous bolus furosemide to allow for proper diuresis is essential.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Myxedema

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## Question 106:

A 57-year-old male presents to the provider with complaints of severe headaches, abdominal pain, and weakness. He also adds that he has been vomiting blood during his episodes of cough for several weeks and feels short of breath. He has been smoking a pack of cigarettes for the past 35 years. On further evaluation, he states his clothes have become significantly looser. Laboratory evaluation reveals a serum calcium of 14 mg/dL. Which of the following is most likely responsible for the increased calcium seen in this patient?

## Choices:

1. Excess Vitamin D
2. Increased parathyroid hormone
3. Increased parathyroid (PTH) hormone-related-protein
4. Excessive intake of absorbable alkali

## Answer: 3 - Increased parathyroid (PTH) hormone-related-protein

## Explanations:

- Hypercalcemia is defined as serum calcium concentration, two standard deviations above the mean values. The normal serum calcium ranges from 8.8 mg/dL-10.8 mg/dL.
- The patient in the given scenario is experiencing symptoms of hypercalcemia, which can be summarized as "groans, bones, stones, moans, thrones and psychic overtones." This includes abdominal pain, nausea, vomiting, bone pain, fatigue, malaise, polyuria, polydipsia, constipation, lethargy, headache, confusion, depression, and memory loss.
- Calcium levels over 14 mg/dL are associated with malignancy. The patient most likely has a lung malignancy.
- In patients with hypercalcemia associated with malignancy, the PTH-related peptide levels are elevated. The PTH related peptide increase levels of calcium by causing activation of the parathyroid hormone receptor, excessive bone resorption, and increased reabsorption of calcium from the distal convoluted tubules of the kidneys.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hypercalcemia

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## Question 107:

A 21-year-old lady gives birth to her first child, who is a boy, at 38 weeks of gestation by a prolonged vaginal delivery. She develops significant bleeding from an atonic uterus after the delivery. Her blood pressure remains low for almost 4 hours and requires 4 units of blood transfusion. She recovers fully and is discharged on the fifth day. After two weeks, she presents to the outpatient clinic with complaints of fatigue and reduced milk secretion. Her pulse rate is 64/minute, and her blood pressure is 90/60 mm Hg. What serum sodium value will most likely be seen on her serum electrolyte panel?

## Choices:

1. 120 mEq/L
2. 137 mEq/L
3. 145 mEq/L
4. 150 mEq/L

## Answer: 1 - 120 mEq/L

## Explanations:

- The patient is likely to have the diagnosis of Sheehan syndrome, which is a rare disorder that occurs after severe postpartum hemorrhage.
- Postpartum hemorrhage or prolonged hypotension causes pituitary ischemia.
- Symptoms of hypothyroidism may occur months after childbirth, and the patient may complain of fatigue, asthenia or weakness, hair loss, constipation, weight gain, problems with focusing or with their attention span, and cold intolerance.
- Physicians may note hypotension and bradycardia during the physical exam. Patients may also exhibit a secondary adrenal insufficiency, which could have symptoms of fatigue and weight loss. Lab values may reflect hypoglycemia, hyponatremia, and/or anemia.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Sheehan Syndrome

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## Question 108:

A 16-year-old male with a past medical history of cystic fibrosis presents for a routine visit. He reports that he is at his baseline health and denies any polyuria or polydipsia. His hemoglobin A1c level is 6.3%, and a 2-hr 75 g oral glucose tolerance test plasma glucose level is 210 mg/dL. What is the most appropriate next step in the management of this patient?

## Choices:

1. Start therapy with metformin
2. Start therapy with sulfonylurea
3. Start therapy with insulin
4. Obtain autoantibodies for islet cell antibody (ICA) and glutamic acid decarboxylase antibody (GAD65)

## Answer: 3 - Start therapy with insulin

## Explanations:

- The patient meets diagnostic criteria for cystic fibrosis-related diabetes and should start insulin therapy to initiate treatment. At baseline health, the diagnosis of cystic fibrosis-related diabetes is be made with a 2-hour oral glucose tolerance plasma glucose level of 200 mg/dL, fasting plasma glucose of 126mg/dL, HgbA1c level 6.5%, and/or random glucose 200 mg/dL with clinical symptoms.
- Insulin is the only recommended treatment option for cystic fibrosis-related diabetes. Initiation of early insulin therapy has been shown to improve glycemic control, improve weight gain, improve pulmonary function, and decrease mortality associated with cystic fibrosis-related diabetes.
- There is currently insufficient data to recommend non-insulin injectables or oral hypoglycemics agents in CFRD.
- A low hemoglobin A1c does not rule out cystic fibrosis-related diabetes. Hemoglobin A1c levels can be falsely low in individuals with cystic fibrosis and have a low sensitivity to detect cystic fibrosis-related diabetes. Hemoglobin A1c levels are not an effective tool to screen for CFRD but can be reliably used to monitor response to treatment after establishing a diagnosis.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Cystic Fibrosis Related Diabetes

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## Question 109:

A 36-year-old woman is evaluated for chronic fatigue for six months. She states that she no longer feels the desire to do the activities she used to enjoy like going to the park with her friends, she is always tired, and that she has gained approximately 15 pounds (7 kg) associated with constipation in the past month regardless of a balanced diet. She has no significant past medical history and is on no medications. She reports that she has never been pregnant. Her last menstrual period was three weeks ago for which she used eight pads per day and lasts for seven days. On physical examination, she is afebrile. Her blood pressure is 117/82 mmHg, heart rate 52/min, respiratory rate 18/min, and BMI is 30. She appears to have conjunctival pallor, a 3-second capillary refill, and a puffy face. Which of the following sets of labs is most likely expected in this patient?

## Choices:

1. MCV 72 fL, hemoglobin 12 g/dL, TSH 1.2 mU/L, FT4 5 ng/dL
2. MCV 72 fL, hemoglobin 10 g/dL, hematocrit 30.2%, TSH 8.0 mU/L, FT3 0.3 ng/dL
3. Hemoglobin 11 g/dL, hematocrit 33%, blood lead level positive, TSH 0.2 mU/L
4. Rheumatoid factor positive, anti-double-stranded DNA positive, MCV 102 fL, hemoglobin 12 g/dL, hematocrit 36%

## Answer: 2 - MCV 72 fL, hemoglobin 10 g/dL, hematocrit 30.2%, TSH 8.0 mU/L, FT3 0.3 ng/dL

## Explanations:

- This patient is suffering from menorrhagia secondary to hypothyroidism. Menorrhagia will appear with an MCV below 80 fL and hemoglobin below 12.0 g/dL while hypothyroidism will have an increased TSH with decreased T3 and T4 levels.
- Hypothyroidism can have many different presentations including signs of depression, weight gain, dry, cool skin, puffy facies, constipation, carpal tunnel syndrome, menorrhagia, and bradycardia. TSH should be elevated in hypothyroidism with a decreased free T3 and T4. Because this patient also presents with menorrhagia (8 pads per day with a cycle lasting 7 days), she can also present with iron deficiency anemia.
- This patient's presentation is classic for hypothyroidism and should be treated as such with proper levothyroxine supplementation and iron supplementation until the menorrhagia has resolved.
- This patient does not have signs of rheumatologic disease such as systemic lupus erythematosus (SLE). SLE can present with lab values shows positive anti-double-stranded DNA antibodies and possibly a positive rheumatoid factor. In addition, because this is a disease with chronic inflammation, the MCV is expected to be in the range of microcytic anemia (below 80 fL) secondary to anemia of chronic disease. As a result, the hemoglobin and hematocrit will also be expected to be decreased from the reference range. Anemia of chronic disease can have similar laboratory values in terms of MCV, hemoglobin, and hematocrit due to their similar mechanism of releasing hepcidin which decreases intestinal iron absorption and increases hepatic iron storage causing the effect of iron deficiency.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Mean Corpuscular Volume

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## Question 110:

A 25-year-old male with a history of Graves disease presents to the emergency department due to severe shortness of breath. The patient is somnolence with an oxygen saturation of 88% and a heart rate of 150/min with atrial fibrillation. TSH was found to be 0.001 mU/L with free T4 7.5 ng/dL. Treatment with propylthiouracil is initiated. Which of the following is the next best step in the management of this patient?

## Choices:

1. Methimazole
2. Potassium iodide
3. Emergency surgery
4. Emergency radioactive iodine

## Answer: 2 - Potassium iodide

## Explanations:

- In patients with thyroid storm, the guidelines recommend to start first PTU (thionamides) and then 1 hour later start the potassium iodide.
- Potassium iodide can aggravate the thyroid storm if the thyroid is not blocked already with another agent. Potassium iodide is a large amount of iodine that is the main fuel to produce thyroid hormones.
- In thyroid storm, potassium iodide works by saturating all the iodine receptors in the thyroid preventing the formation of new thyroid hormones and controlling faster the hyperthyroidism.
- Never start the potassium iodide before thyroid blocking agent because it can increase the risk of worsening the hyperthyroidism. Patients in developed countries with normal iodine intake don't require an extra dose of KI; this will not help in the thyroid function and can have a more adverse reaction. KI has no role in hypothyroidism for iodine replacement.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Potassium Iodide

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## Question 111:

A 32-year-old female with a history of end-stage renal disease and systemic lupus erythematosus is undergoing a kidney transplant. Her only medication is hydroxychloroquine. Her vital signs are within normal limits while her BMI is 32. After the transplant, her blood glucose level ranges between 240-324 mg/dL. New-onset diabetes mellitus after transplantation (NODAT) has diagnosed in the patient. Which of the following is most accurate about the patient's condition?

## Choices:

1. This condition is temporary and diabetic microvascular complications are less common in this patient
2. Her diabetes will be controlled by decreasing the dose of immunosuppressants and antidiabetic agents are not necessary for the treatment
3. There is an increased risk of pregnancy with complications so pregnancy should be postponed for 3 months after the transplantation
4. The goal of hemoglobin A1c (HbA1c) is 7%–7.5% in this patient

## Answer: 4 - The goal of hemoglobin A1c (HbA1c) is 7%–7.5% in this patient

## Explanations:

- As per guidelines, the goal of HbA1c in patients out of the transplant setting is less than 7%. Because the transplant patients are at increased risk of hypoglycemia due to reduced renal function and frequent history of heart disease, the Kidney Disease: Improving Global Outcomes (KDIGO) guidelines recommend an HbA1c goal of 7.0–7.5% in these patients.
- Diabetic microvascular complications develop more quickly with NODAT than traditional diabetes.
- Those patients who desire to get pregnant should be encouraged to wait at least for 1 year after the transplantation to decrease the risk of rejection.
- Subcutaneous insulin doses can be calculated to be used after proper glycemic control or upon discharge. Oral hypoglycemic therapy at the time of discharge can be considered in patients who required low-dose insulin therapy in the inpatient setting.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### New Onset Diabetes After Transplant

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## Question 112: A 47-year-old female was diagnosed with diabetes mellitus type 2 six months ago. She is doing her best with diet and exercise. A lipid profile shows total cholesterol is 215 mg/dL, LDL is 140 mg/dL, HDL is 45 mg/dL, and triglycerides are 160 mg/dL. Which of the following is appropriate for the management of this patient?

## Choices:

1. Inform the patient that she has 3 months to bring the values down, or else she will be on medication for life
2. Start a statin to lower the LDL to less than 100 mg/dL
3. Start a fibrate to lower the triglycerides to less than 150 mg/dL and raise the HDL to over 50 mg/dL
4. No medications are necessary

## Answer: 2 - Start a statin to lower the LDL to less than 100 mg/dL

## Explanations:

- A 6-month trial of dieting is adequate for lowering lipids.
- Decreasing the LDL to less than 100 mg/dL will decrease the risk of cardiac events in patients with diabetes mellitus.
- Statins are the first-line treatment for lowering total cholesterol and LDL.
- Depending on the cardiac risks of a patient, the American College of Cardiology/American Heart Association (ACC/AHA) guidelines recommends statin therapy based on its intensity. For example, if the calculated risk for heart disease or stroke is over 7.5%, the ACC/AHA guidelines suggest the patient should be on a high-intensity statin.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hyperlipidemia

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## Question 113:

A 42-year-old male on the medical-surgical floor is being treated for unexplained intra-abdominal bleeding. He underwent a CT scan with iodinated contrast medium (ICM) and developed tachycardia, restlessness, sweating, and diarrhea shortly after that. His treating team suspects the Jod-Basedow phenomenon. The patient is concerned about how long he should expect his symptoms to last. Which of the following best answers his question?

## Choices:

1. Symptoms of hyperthyroidism due to Jod-Basedow phenomenon are much like autoimmune hyperthyroidism and treatment will likely be lifelong
2. Symptoms of hyperthyroidism due to Jod-Basedow phenomenon typically resolve with no permanent sequelae
3. Symptoms of hyperthyroidism due to Jod-Basedow phenomenon usually progress to thyroid storm within hours; after the resolution of thyroid storm, a hypothyroid state will likely follow
4. Symptoms of hyperthyroidism due to Jod-Basedow phenomenon will not likely resolve without surgery

## Answer: 2 - Symptoms of hyperthyroidism due to Jod-Basedow phenomenon typically resolve with no permanent sequelae

## Explanations:

- To diagnose the Jod-Basedow phenomenon, a diagnosis of autoimmune thyroiditis should be ruled out by ordering a thyroid stimulating hormone antibody (TSI). TSI would be negative in Jod-Basedow phenomenon, but positive in autoimmune thyroiditis.
- Jod-Basedow phenomenon usually has a favorable prognosis. Most patients return to their baseline thyroid status after their iodide levels return to normal.
- Rare complications of Jod-Basedow phenomenon include permanent hyperthyroidism, atrial fibrillation, thyroid storm, and fetal hypothyroidism in cases of gestational exposure to iodinated contrast medium.
- Jod-Basedow phenomenon does not require surgery and can be managed medically with antithyroid medications, such as methimazole.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Jod Basedow Syndrome

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## Question 114: A 50-year-old male presents to the clinic with a palpable, central neck mass that has been present for several months. He admits to a history of joint pain and arthritis that has been progressively worsening. He had a kidney stone 2 weeks ago that brought him to the emergency department (ED) because he was in excruciating pain. In the ED the patient was found to have hypercalcemia and a parathyroid hormone level of 10 times the upper limit of normal. What is the likely pathology?

## Choices:

1. Benign primary hyperparathyroidism
2. Parathyroid carcinoma
3. Papillary thyroid carcinoma
4. Medullary thyroid carcinoma

## Answer: 2 - Parathyroid carcinoma

## Explanations:

- Laboratory evaluation is similar to that of primary hyperparathyroidism, which includes parathyroid hormone (PTH) and serum calcium levels. PTH and calcium levels tend to be higher in parathyroid carcinoma compared with primary hyperparathyroidism.
- A PTH level three times the upper limit of normal is suspicious, but a PTH level of 10 times the upper limit of normal has a positive predictive value of 84% for parathyroid carcinoma.
- A palpable neck mass in combination with hyperparathyroidism or hypercalcemia is suggestive of parathyroid carcinoma.
- Fifty percent of patients with parathyroid carcinoma present with a palpable central neck mass, kidney stones, or osteoporosis.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Parathyroid Cancer

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 115:

A 34-year-old female with a past medical history of Graves disease presents to your clinic for a 1 year follow up. Her current hyperthyroidism medications include methimazole. Lab results indicate that the methimazole has failed to achieve euthyroid status. The patient inquires about radioactive iodine therapy (RAI) as a means of treating her hyperthyroidism. What should be ordered before initiating RAI therapy?

## Choices:

1. A repeat thyroid stimulating hormone for confirmation
2. A renal panel
3. A hepatitis panel
4. Serum beta-hCG

## Answer: 4 - Serum beta-hCG

## Explanations:

- Radioactive iodine therapy (RAI) is a definitive treatment for hyperthyroidism. A single dose of iodine-131 can permanently treat hyperthyroidism in a significant portion of patients.
- RAI is contraindicated in pregnancy and in breastfeeding mothers. Although RAI typically is used in older patients, pregnancy must first be ruled out in a female of reproductive-bearing age before RAI therapy is initiated.
- It typically takes several months after RAI therapy to see laboratory evidence of a euthyroid state.
- Subsequent hypothyroidism can occur in patients following RAI therapy. This can be managed with supplemental thyroxine.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hyperthyroidism

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## Question 116: A 65-year old male with uncontrolled type 2 diabetes mellitus who is admitted to the cardiac care unit after undergoing three-vessel coronary artery bypass graft after a recent myocardial infarction. He is currently receiving intravenous insulin infusion for his hyperglycemia. On a postoperative day 3, you note that he is off vasopressors and his blood glucose is maintained between 130 to 160 mg/dL on a stable rate of insulin infusion. However, his caloric intake is minimal. You plan to transition him to subcutaneous insulin based on the average rate of infusion over the last 6 hours of 1.5 units/hour. What are the best process and insulin doses needed to manage this transition?

## Choices:

1. Two hours prior to discontinuing the intravenous insulin infusion, administer subcutaneous insulin glargine 25 units
2. Simultaneously, discontinue the intravenous insulin drip and administer subcutaneous insulin glargine 25 units
3. Two hours prior to discontinuing intravenous insulin, administer subcutaneous insulin glargine 18 units
4. Discontinue intravenous insulin drip and start correctional insulin coverage every 4 hours

## Answer: 1 - Two hours prior to discontinuing the intravenous insulin infusion, administer subcutaneous insulin glargine 25 units

## Explanations:

- Due to the extremely short half-life of intravenous (IV) insulin and delayed onset of action of long-acting subcutaneous insulin, it is important to overlap the two types of insulin by 2-3 hours. Premature discontinuation of IV insulin creates a hiatus in basal insulin supply, which risks rebound hyperglycemia or metabolic decompensation.
- When using the rate of infusion to calculate the basal insulin dose, the average rate of infusion over the last 6 to 8 hours is extrapolated to 24 hours. Seventy to eighty percent of this extrapolated dose represents the total daily dose (TDD) of insulin requirement. In a patient with minimal or no caloric intake, 100% of TDD is the basal requirement. In patients with optimal caloric intake, half of TDD should be administered as basal insulin and the other half as nutritional insulin.
- In the above case scenario, the average rate of infusion is 1.5 units/hour over the last 6 hours. On extrapolating this to the 24-hour period, the average amount of insulin is 36 units. As a patient has minimal caloric intake, 70-80% of the extrapolated dose (25-28 units) is the basal requirement and should be administered at least 2 hours before discontinuation of IV insulin.
- If the patient in the above case had an optimal caloric intake while on the insulin drip, then option three would have been the right choice. In that case, the calculate TDD (i.e.70-80% of the extrapolated dose) would represent both basal and nutritional requirements as correctional insulin alone does not provide any basal coverage and risks wide fluctuations in glycemic control.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Diabetic Perioperative Management

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 117:

A 16-year-old girl is brought to the physician because her mother is concerned about the lack of menstruation. The patient has a history of hypothyroidism diagnosed 3 years ago and nonadherent treatment. Physical examination reveals Tanner stage III pubic hair and Tanner stage II for breast-genitals. Which of the following best explains how the abnormal thyroid status could affect the delayed puberty in this patient?

## Choices:

1. Increase gonadotropin-inhibiting hormone (GnIH) expression
2. Increase Kiss1 mRNA expression
3. Defective migration of GnRH releasing neurons
4. Defect in the androgen receptor

## Answer: 1 - Increase gonadotropin-inhibiting hormone (GnIH) expression

## Explanations:

- GnIH is a newly discovered hypothalamic neuropeptide that actively inhibits gonadotropin synthesis and release. It has been demonstrated that GnIH serves as a key player regulating reproduction and a role as a negative regulator of reproduction.
- Recently studies examined the effect of abnormal thyroid status on pubertal onset in female mice and showed hypothalamic GnIH mRNA expression is increased. Higher levels of thyroid hormone suppress GnIH expression, and lower levels of thyroid hormone are associated with higher GnIH levels. Hypothyroidism may delay the pubertal onset of female mice by the increase in GnIH expression in the hypothalamus, demonstrating that GnIH mediates interactions between the HPG and HPT (hypothalamic-pituitary-thyroid) axes.
- Thyroid dysfunction alters GnIH expression in the hypothalamus by changing chromatin modification of the GnIH promoter region in female mice, the expression of GnIH acts at the most upstream level of the HPG axis by inhibiting the activity of GnRH neurons to reduce gonadotropin secretion from gonadotropes.
- In a hypothyroid status, increased GnIH and decreased Kiss1 mRNA expression would result in decreased pituitary LH release and reduced circulating E2 levels, leading to the delayed pubertal onset. TH-mediated HPG regulation may be initiated by controlling the expression of GnIH, which may act on the most upstream level of the HPG axis by inhibiting the neuronal activities of GnRH and kisspeptin, and also gonadotropin secretion.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Physiology, Gonadotropin Inhibitor

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 118:

A 39-year-old female presents to her internist's office with 4-month history of constipation, cold intolerance, fatigue, loss of appetite, and menstrual irregularities. Past medical history is notable for vitiligo, and she has never had any surgeries. She takes triamcinolone 0.1% cream. The patient belongs to The Church of Jesus Christ of Latter-Day Saints and exercises daily. Vital signs are notable for temperature 35.1 C (95.2 F), blood pressure 142/90 mmHg, pulse rate 45/min and regular, and BMI 27 kg/m2. Physical exam reveals a female in no acute distress with periorbital edema. Skin is dry skin with scattered hypopigmentation over dorsal surfaces of hands and feet. Heart auscultation demonstrates sinus bradycardia without murmurs or rubs. Reflexes are +1/4 bilaterally and delayed in Achilles. Labs are notable for hemoglobin 9.8 mg/dL (12-16 mg/dL), MCV 103 fL (80-100 fL), and reticulocyte 0.9%. Fasting lipid profile demonstrates total cholesterol 290 mg/dL, LDL 155 mg/dL, and HDL 35 mg/dL. Urine beta-hCG and urinalysis are negative. Other labs including coagulation profile, creatinine, and liver enzymes are unremarkable. Which of the following is the most appropriate next step in management?

## Choices:

1. Tissue transglutaminase antibodies
2. Intrinsic factor antibodies
3. Methylmalonic acid level
4. Thyroid stimulating hormone

## Answer: 4 - Thyroid stimulating hormone

## Explanations:

- Macrocytic anemia is characterized by high MCV (>100 fL). Mild macrocytic anemia (MCV 100 to 110 fL) is more likely to be caused by benign conditions compared to marked macrocytic anemia (MCV >110 fL), the latter of which is due to primary bone marrow disease.
- Hypothyroidism, low levels of thyroid hormone due to primary (thyroid) or secondary (hypothalamic-pituitary) disease, is associated with macrocytic anemia. Excess lipids are deposited in the red cell membrane, increasing the MCV.
- Other benign conditions associated with macrocytic anemia are the liver disease, also due to lipid deposition in the cell membrane, alcohol consumption, hereditary spherocytosis (impaired volume regulation increases red cell size), and marked reticulocytosis from hemolysis or pregnancy. Reticulocytes are larger than the average red blood cell.
- Initial evaluation of macrocytic anemia includes a thorough history and physical followed by limited labs including reticulocyte count, serum B12 and folate levels, TSH, and liver function tests.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Macrocytic Anemia

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## Question 119:

A 78-year-old female with hypertension and diabetes mellitus is new to the practice. She is on lisinopril 40 mg a day and metformin extended-release 1 gram a day. Her blood pressure is well controlled, and the exam is unremarkable. Laboratories show a glucose of 190 mg/dL, hemoglobin A1c 6.5%, potassium 4.6 mEq/L, creatinine 1.8 mg/dL, and 1+ protein in the urine. The estimated glomerular filtration rate is 28. A review of her records shows an increase in her creatinine compared to a year ago. What is the appropriate management?

## Choices:

1. Continue the same medications
2. Stop metformin and start another oral hypoglycemic medication
3. Decrease the dose of lisinopril
4. Discontinue lisinopril

## Answer: 2 - Stop metformin and start another oral hypoglycemic medication

## Explanations:

- This patient has renal insufficiency, making continuing metformin inappropriate because of the increased risk of lactic acidosis.
- Diabetic nephropathy is best treated with ACE inhibitors, so lisinopril should be continued with monitoring of creatinine and potassium. Her blood pressure is well controlled; therefore, no change in dose is needed.
- The hemoglobin A1c is acceptable but will need to be rechecked 3 months after initiating a new oral hypoglycemic.
- Metformin is contraindicated in severe renal dysfunction with an eGFR 30 mL/min/1.73 $m^2$.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Metformin

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## Question 120:

A 39-year-old female patient with past medical history significant for schizophrenia is referred for evaluation of galactorrhea. The patient first noticed milk discharge from her breast two years ago. She notices it mainly when she showers. She also reports amenorrhea for two years. No history of headaches, visual disturbances, increase in shoe size, weight gain, or easy bruising. Her schizophrenia is well controlled with risperidone. Physical examination was normal. Prolactin level was elevated at 220 (0-25 ng/dl). Magnetic resonance imaging (MRI) of the pituitary gland did not reveal any microadenomas. What is the next best step in management?

## Choices:

1. Start treatment with dopamine agonists for hyperprolactinemia
2. Stop risperidone
3. Surgical excision of the tumor
4. Start treatment with oral contraceptive pills for menstrual cycle regulation

## Answer: 4 - Start treatment with oral contraceptive pills for menstrual cycle regulation

## Explanations:

- Medications that can cause galactorrhea include phenothiazines, estrogen, alpha-methyldopa, metoclopramide, tricyclic antidepressants, selective serotonin reuptake inhibitors, opiates, and cimetidine.
- Typically, the size of the tumor correlates with the level of prolactin. Microprolactinomas are associated with prolactin of greater than 200 ng/dl whereas macroprolactinomas are associated with prolactin greater than 1000 ng/dl. However, risperidone can raise the prolactin level to greater than 200 ng/dl and can be confused with a prolactinoma.
- Since the patient's schizophrenia is well controlled with risperidone, it is best to continue it. Dopamine agonists can antagonize the action of risperidone and exacerbate schizophrenia and therefore are contraindicated.
- Oral contraceptive pills can be used in this patient to regulate menstrual cycles and prevent osteopenia. As long as medication-induced galactorrhea is not socially distressing to the patient, it can be observed.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Galactorrhea

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## Question 121:

A 45-year-old woman presents for routine follow-up. She is healthy and takes no medication. Family history is notable for myocardial infarction in her father at 68 years of age. She smokes one pack of cigarettes per day. Her vital signs are normal, and her BMI is 28 kg/m2. Physical examination is unremarkable. Recent labs demonstrate total cholesterol 250 mg/dL (5.3 mmol/L), LDL cholesterol 170 mg/dL (4.4 mmol/L), triglycerides 200 mg/dL (5.2 mmol/L) and HDL cholesterol 40 mg/dL (1.0 mmol/L). Liver enzymes and thyroid function are within normal limits. Her calculated 10-year risk for atherosclerotic cardiovascular disease (ASCVD) is 1.7%. What is the best initial step in the management of this patient's hyperlipidemia?

## Choices:

1. Initiate low-intensity statin therapy
2. Repeat lipid panel in 3 months
3. Recommend lifestyle modification
4. Initiate moderate-intensity statin therapy

## Answer: 3 - Recommend lifestyle modification

## Explanations:

- In this patient with a low 10-year risk of ASCVD (5%), the initial management for hyperlipidemia is therapeutic lifestyle modification. Following initiation of lifestyle changes, obtain a repeat lipid panel in 4-6 months.
- ASCVD risk reduction in all patients includes counseling regarding a heart-healthy diet and physical activity.
- Specific lifestyle interventions in this patient include tobacco cessation and weight loss counseling.
- In adult patients 40-70 years of age with an intermediate risk (= 7.5% to 20%) of ASCVD, moderate-intensity statin therapy may be initiated depending on the presence of risk-enhancing factors.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Cholesterol Levels

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## Question 122: A 55-year-old white female with a history of hypertension, dyslipidemia, and end-stage renal disease is under evaluation for a kidney transplant. Her medications are aspirin, metoprolol, atorvastatin, and vitamin D. After the surgery, her blood glucose increases to 324 mg/dL, and intravenous insulin therapy is started for glucose control. Which of the following medications is known to increase blood glucose after transplant?

## Choices:

1. Tacrolimus
2. Mycophenolate mofetil
3. Azathioprine
4. Leflunomide

## Answer: 1 - Tacrolimus

## Explanations:

- New-onset diabetes mellitus after transplantation (NODAT) is the occurrence of diabetes mellitus (DM) in previously non-diabetic persons after solid organ transplantation. NODAT frequently occurs after organ transplantation and increases the risk of infection and mortality rates.
- Calcineurin inhibitors such as tacrolimus and cyclosporine and inhibitors of the mammalian target of rapamycin such as sirolimus or rapamycin and everolimus are known to contribute to NODAT.
- Tacrolimus causes glucose intolerance mainly by decreasing insulin secretion.
- Mycophenolate mofetil and azathioprine do not affect insulin action or glucose metabolism, so they do not have a major role in NODAT.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### New Onset Diabetes After Transplant

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## Question 123:

A 30-year-old female with a past medical history of hypothyroidism, diabetes mellitus, congestive heart failure, and atopic dermatitis presented to the clinic with a rash on her lower extremity. The rash is characterized by papules and nodules with a central keratotic plug. Which comorbidity most likely contributed to the development of this rash?

## Choices:

1. Hypothyroidism
2. Congestive heart failure
3. Diabetes mellitus
4. Atopic dermatitis

## Answer: 3 - Diabetes mellitus

## Explanations:

- Kyrle disease is commonly associated with diabetes mellitus, especially in those with diabetic nephropathy. The exact mechanism underlying this association is unknown but may be related to hyperphosphatemia rather than hyperglycemia.
- Kyrle disease can also be associated with congestive heart failure, hepatic and endocrinologic disorders, tuberculosis, pulmonary aspergillosis, scabies, atopic dermatitis, AIDS, neurodermatitis, and malignancy. However, these are less common associations compared to end-stage renal disease and diabetes mellitus.
- It has also been postulated that end-glycosylation products and oxidized low-density lipoproteins lead to abnormal keratinization, defective differentiation of epidermis and dermo-epidermal junction and vasculopathy, which also may explain the increased incidence of Kyrle disease in diabetes mellitus.
- It has been estimated that 10% of hemodialysis patients will develop Kyrle disease.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Kyrle Disease

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## Question 124:

A 56-year-old female presents to the hospital with shortness of breath. She has a past medical history of hypertension, hyperlipidemia, type 2 diabetes mellitus, and COPD. She also notes nausea but denies vomiting, chest pain, or abdominal pain. Physical examination shows a distressed female with deep, prolonged respirations; however, lungs are clear to auscultation. The abdomen is non-tender and non-distended. Vital signs show a heart rate of 120/min, respiratory rate 28/min, blood pressure 120/70 mmHg, temperature 37.2 C, and Sp02 99% on room air. Lab work reveals pH 7.1, pCO2 13 mmHg, pO2 90 mmHg, HCO3 less than 6 mEq/L, sodium 130 mEq/L, potassium 4.0 mEq/L, chloride 100 mEq/L, creatinine 1.3 mg/dL, BUN 24 mg/dL, and glucose 200 mg/dL. Urinalysis shows 3+ ketones. Which of the following medications most likely caused this patient's symptoms?

## Choices:

1. Metformin
2. Glyburide
3. Insulin
4. Canagliflozin

## Answer: 4 - Canagliflozin

## Explanations:

- Canagliflozin is an SGLT-2 inhibitor that has been shown to be associated with DKA with euglycemia.
- SGLT-2 inhibitors affect the proximal convoluted tubule of the nephron to prevent reabsorption of glucose.
- Over time, this can result in severe dehydration and acidosis, while maintaining euglycemia.
- Metformin can cause severe lactic acidosis, however, this patient is in DKA, which is not precipitated by metformin. Glyburide can cause hypoglycemia but is unlikely to result in severe acidosis. Insulin can result in hypoglycemia but is unlikely to cause severe acidosis.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Euglycemic Diabetic Ketoacidosis

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## Question 125: A 30-year-old male with a history of uncontrolled hypertension presents to the clinic for follow up. He was recently admitted to the hospital for a hypertensive emergency and hypokalemia. He had a computed tomography scan of the abdomen which revealed a 2 cm benign-appearing right adrenal mass. His cortisol and urinary vanillylmandelic acid levels were normal, but he had an increased serum aldosterone to renin ratio. What is the next best step in management?

## Choices:

1. Adrenal vein sampling
2. Right adrenalectomy
3. Long term spironolactone therapy
4. Biopsy of the adrenal mass

## Answer: 2 - Right adrenalectomy

## Explanations:

- The patient demonstrates hyperaldosteronism with the adrenal nodule. The patient can be directly referred for an adrenalectomy.
- In patients younger than 40 years of age with an adrenal adenoma and hyperaldosteronism, adrenal vein sampling is not necessary.
- Although he will require spironolactone in the preoperative period to control blood pressure, it is not recommended alone as a long-term therapy without surgery, especially in younger patients. However, medical management with spironolactone can be used for the long-term in patients who are poor surgical candidates or refuse surgery.
- A biopsy of the mass will provide no additional diagnostic information and is therefore not recommended.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Adrenal Adenoma

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## Question 126:

A 55-year-old white male presented with lethargy, nausea, vomiting and persistent diarrhea. Further questioning revealed he has persistent diarrhea for over a year with stool quantity frequently over 1000 ml/ day. Blood work showed serum sodium 147 mmol/L (normal 134-144), serum potassium 2.7 mmol/L (normal 3.5 - 5.2 ), serum bicarbonate 17 mmol/l (normal 18-29), fasting glucose 165 mg/dl (normal 65-99), serum calcium 11.3 mg/dl (8.6 -10.2) and serum albumin 4.2 g/dl (3.5-4.7) . He was admitted, fluids and electrolytes were replaced. Which of the following blood test should be drawn next to confirm the suspected diagnosis?

## Choices:

1. Serum gastrin level
2. Serum VIP level
3. Serum 5- HIAA levels
4. Serum metanephrine levels

## Answer: 2 - Serum VIP level

## Explanations:

- The history and laboratory findings suggest VIPoma tumor. VIPomas are rare tumors which can cause secretory diarrhea with may be present for several years prior to diagnosis. Typically, stool amount exceeds 700 ml/day despite fasting.
- Diagnosis of VIPoma is made in patients with secretory diarrhea with elevated serum VIP levels. It is important to repeat levels of VIP to confirm diagnosis since levels may not be elevated between episodes of watery diarrhea.
- Serum gastrin levels are elevated with gastrinomas, and serum 5 HIAA may be elevated with carcinoid tumors. They may need to be ruled out as other causes of diarrhea.
- Serum metanephrine levels are usually elevated with pheochromocytoma.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### ViPoma

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## Question 127: A 23-year-old female presents with concerns about her menstrual cycle. She reports irregular cycles, acne, and continued weight gain over the last two years. Her lab results demonstrate an elevated luteinizing hormone to follicle-stimulating hormone ratio. What finding would you expect on transvaginal ultrasound?

## Choices:

1. Small, underdeveloped ovaries
2. An intrauterine pregnancy
3. Ovaries with more than 12 large follicles
4. An irregularly shaped and enlarged uterus

## Answer: 3 - Ovaries with more than 12 large follicles

## Explanations:

- An elevated luteinizing hormone (LH) to follicle-stimulating hormone (FSH) ratio is a key finding in polycystic ovarian syndrome (PCOS). This skewed ratio causes anovulatory cycles. Because LH levels are excessively high in PCOS, there is no LH surge to cause ovulation. This leads to multiple ovarian follicles visible on ultrasound that have not ovulated.
- LH normally stimulates the theca cells in the ovaries to produce androgens. FSH stimulates the granulosa cells to produce aromatase to convert those androgens into estradiol. Elevated LH relative to FSH leads to excess androgens.
- Elevated androgens in women with PCOS leads to hirsutism and acne.
- PCOS also is associated with weight gain and insulin resistance.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Physiology, Follicle Stimulating Hormone

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## Question 128:

A 45-year-old woman presents for dietary advice. Her past medical history includes hyperlipidemia, obesity, and hypertension. She is advised to primarily eat plant-based food, including vegetables, fruit, and whole grains. Instead of butter, she is to use canola or olive oil. She is also advised that fish and seafood should be consumed twice a week while red meat and sweets should be limited. Following this diet, which lipid parameter change is most likely?

## Choices:

1. Increased high-density lipoprotein
2. Decreased low-density lipoprotein
3. Decreased high-density lipoprotein
4. Increased very low-density lipoprotein

## Answer: 2 - Decreased low-density lipoprotein

## Explanations:

- The Mediterranean diet is an eating plan that emphasizes healthy fats, fruits, vegetables, whole grains, beans, nuts, and seeds.
- It decreases the risk of atherosclerosis, coronary artery disease, and cerebrovascular disease.
- Lipid levels improve as low-density lipoprotein (LDL) and triglycerides decrease.
- High-density lipoproteins (HDL) levels are not affected, but the existing particles have improved function.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Mediterranean Diet

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## Question 129: A patient with type 2 diabetes mellitus presents complaining of nausea, vomiting, abdominal bloating, tachypnea, and feeling weak. Palpation reveals a tender and enlarged liver and elevated liver enzymes. His serum bicarbonate is low, and his lactate level reads high at 4.5 mmol/L. Which anti-glycemic drug is the most likely culprit?

## Choices:

1. Metformin
2. Glimepiride
3. Pioglitazone
4. Nateglinide

## Answer: 1 - Metformin

## Explanations:

- Metformin has a black box warning for lactic acidosis.
- The risk is low, but in instances when it does occur it can be fatal.
- A high blood lactic acid level is concerning, particularly when the drug is prescribed in high doses. It should not be used in those with significant liver or kidney problems. While no clear harm comes from use during pregnancy, insulin is preferred for gestational diabetes.
- The most common adverse effects of metformin are diarrhea, abdominal cramps, nausea, vomiting, and flatulence.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Metformin

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## Question 130: A 34-year-old male with a BMI of 36.2 and newly diagnosed type 2 diabetes mellitus presents for evaluation for bariatric surgery. After the surgeon explains that he is, in fact, a candidate for weight loss surgery, the patient asks if there is a possibility that his diabetes will be well controlled after surgery. What should he be told?

## Choices:

1. No. Diabetes is a separate disease from obesity, and there is no possibility that his diabetes will improve after surgery
2. No. Diabetes has been shown to improve after weight loss surgery but only in women
3. Yes. While there is no guarantee, research has shown much-improved control of type 2 diabetes in many patients who undergo weight loss surgery and subsequently lose a significant amount of weight
4. Yes. All patients who undergo weight loss surgery see the resolution of their type 2 diabetes.

Answer: 3 - Yes. While there is no guarantee, research has shown much-improved control of type 2 diabetes in many patients who undergo weight loss surgery and subsequently lose a significant amount of weight

## Explanations:

- Many studies have shown that patients who undergo either laparoscopic sleeve gastrectomy or Roux-en-Y gastric bypass surgery, have marked improvement of type 2 diabetes mellitus following surgery and subsequent weight loss.
- Treatment of comorbid conditions such as diabetes, hypertension, and hyperlipidemia, are all secondary benefits of undergoing weight loss surgery.
- Some hypothesize that Roux-en-y gastric bypass surgery, in particular, has an added benefit of treating diabetes due to the hormonal benefit of food no longer passing through the duodenum and the biliary limb.
- Treatment of diabetes is not only a possibility with weight loss surgery; its presence is one of the criteria that makes patients eligible to be considered for the surgery.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Obesity Surgery Indications And Contraindications

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## Question 131: A 16-year-old boy presents to the clinic to establish care. He has a strong family history of diabetes mellitus. His fasting blood sugar is 127 mg/dL. Upon repeat testing, his fasting blood sugars are 115, 130, and 100 mg/dL. Which of the following findings/risk factors, if present, would be most consistent with mature onset diabetes of the young (MODY) in this patient?

## Choices:

1. History of diabetes including his mother and maternal grandmother at ages 45 and 65 years, respectively
2. High C-peptide level with normal BMI
3. High CRP
4. Retinopathy and peripheral neuropathy

## Answer: 2 - High C-peptide level with normal BMI

## Explanations:

- Patients with MODY are typically lean, and they have good pancreatic function shown by normal or high C-peptide levels.
- Patients with MODY typically have strong family histories of diabetes, which stretch across generations, but they are usually diagnosed in childhood or early young age.
- The majority of patients with MODY can be successfully treated with diet or sulfonylureas. If they require insulin it is usually small amounts to cover basal needs and not necessarily prandial needs.
- Most patients with MODY do not develop diabetes complications except in rare types like MODY-5, where there can be progressive loss of renal function independent of diabetic nephropathy.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Maturity Onset Diabetes in the Young

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## Question 132:

A 32-year-old female with long-standing primary hypothyroidism presents to the clinic for a regular visit. Homogeneous pituitary enlargement measuring 2.1 x 1.9 x 1.8 cm was found when a brain MRI was done as part of a headache workup. Lab tests reveal a prolactin level of 44 ng/mL (highest level has been 73 ng/mL). Other pituitary hormone levels are within normal limits. What is the most likely cause of elevated prolactin in this patient?

## Choices:

1. Prolactin-secreting adenoma
2. TRH-stimulating lactotroph cells
3. Nonfunctioning pituitary adenoma
4. Autoimmune hypophysitis

## Answer: 2 - TRH-stimulating lactotroph cells

## Explanations:

- Long-standing primary hypothyroidism results in thyrotroph hyperplasia. The lack of negative feedback from thyroxine leads to elevated levels of thyrotropin-releasing hormone (TRH), stimulating both pituitary thyrotroph and lactotroph cells. This results in increased secretion of thyroid-stimulating hormone and prolactin.
- TRH has a stimulatory effect on lactotroph cells, so mild to moderate hyperprolactinemia occurs in about three-quarters of patients with primary hypothyroidism. The prevalence of hyperprolactinemia has been reported to range from 0-42% in overt hypothyroidism.
- The degree of hyperprolactinemia in primary hypothyroidism is generally modest, and prolactin concentrations rarely exceed 100 ng/mL.
- The degree of hyperprolactinemia in prolactinoma usually exceeds 200 ng/mL.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Pituitary Hyperplasia In Primary Hypothyroidism

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 133:

A 44-year-old male patient presented to the hospital with fever and fatigue. His fever started one day ago and is not associated with cough, sputum production, hemoptysis or urinary symptoms. The patient also complains of easy bruising and impaired hearing sensation. Past surgical history is significant for a right tibial fracture that is not proceeded by significant trauma which was treated with open reduction and internal fixation. Physical examination is remarkable for multiple bruises. His vital signs are as follows: blood pressure of 135/90 mmHg, heart rate of 90 bpm, respiratory rate of 19 bpm and temperature of 38.1 c. His complete blood count shows pancytopenia but the rest of the septic workup was negative. X-ray of the hip showed increase thickening of the bone. CT scan of the head demonstrated thickening of the skull around the foramen lacerum. Which one of the following might be an additional manifestation in this patient?

## Choices:

1. Tracheoesophageal fistula
2. A discoid and malar rash
3. Epigastric pain with perirectal bleeding
4. Decrease salivation and tearing

## Answer: 4 - Decrease salivation and tearing

## Explanations:

- This patient has Paget disease of bone evident by increase bone thickening and pancytopenia. Therefore he had the pathological tibial fracture and the thickening around the foramen lacerum.
- Thickening around the foramen lacerum will cause compression of the deep petrosal nerve and greater petrosal nerve which leads to decrease salivation and tearing.
- The two nerves that pass from the foramen lacerum are the greater petrosal nerve which represents the pre-ganglionic parasympathetic fibers, and the deep petrosal nerve which represents the post-ganglionic sympathetic fibers, both of them form the autonomic fibers of the facial nerve and supply the submandibular, sublingual, salivary, nasal and palatine glands.
- Anatomical variations of the pterygoid canal are very significant for the surgeons who usually take an inferior medial approach to the pterygoid canal when performing a Vidian neurectomy, while in some patients the pterygoid canal is located above the level of the anterior genu of the petrous part of the internal carotid artery.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Anatomy, Head and Neck, Foramen Lacerum

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 134:

A 40-year-old female with a past medical history of diabetes mellitus (DM) and obesity diagnosed one year ago desires bariatric surgery. She is motivated by her colleague who went through surgery a few months ago. She has a job that requires frequent travel and is unable to follow a strict meal plan and finds it difficult to administer insulin injections during travel. Her BMI is 36 kg/m2, blood pressure 145/90 mm/Hg, HbA1C 10.2 percent, and serum glutamic acid decarboxylase antibody (GADA) is positive with moderate titers. Which of the following is expected one year after she undergoes bariatric surgery?

## Choices:

1. A significant reduction in BMI
2. Remission of DM
3. Both a significant reduction in BMI and remission of DM
4. No significant reduction in BMI or remission of DM

## Answer: 1 - A significant reduction in BMI

## Explanations:

- This patient has latent autoimmune diabetes of adults (LADA), as evidenced by onset after age 35 and GADA positivity. A subset of LADA has a higher BMI, and obesity is a feature in some of them in whom bariatric surgery is considered a therapeutic option.
- The subset of patients with LADA with a higher BMI has lower GADA titers, better fasting and stimulated C-peptide, and greater beta-cell reserves than the group with a lower BMI, higher GADA titers, poorer fasting and stimulated C-peptide, and lesser beta-cell reserves. Although the former group is insulin-independent initially, it will ultimately be required as autoimmune destruction continues unabated.
- Bariatric surgery in patients with LADA results in a reduction in BMI, but disappointing results are seen with glycemic targets. Patients on insulin may achieve some reduction in their dosage due to the reduction of the deleterious effects of obesity and insulin resistance but are unable to go off the insulin and certainly do not undergo remission of DM. This is due to the ongoing autoimmune beta-cell destruction and continued need for insulin supplementation.
- Patients with LADA who are obese and desire bariatric surgery should be identified preoperatively by appropriate investigations, including islet autoantibody profile, and stimulated C-peptide response so that realistic goals are set and patients are appropriately counseled.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Latent Autoimmune Diabetes

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 135:

A 45-year-old male with no significant past medical history presents with a 1-day history of renal colic. He takes no medications, and he has no significant family history. On physical exam, pulse is 84/min, BP 120/70 mmHg, and T 36.9 C. A non-contrast CT scan of the abdomen showed a 5 mm left ureteric stone and a 1.5 cm right adrenal mass which has been reported as benign adenoma with a Hounsfield unit less than 10. Urology has planned expectant management for the renal stone. What other investigations are indicated in this case?

## Choices:

1. CT scan of the adrenals with contrast
2. MRI scan of the adrenals
3. Dexamethasone suppression test and plasma fractionated metanephrines
4. Fine needle aspiration of the adrenal mass

## Answer: 3 - Dexamethasone suppression test and plasma fractionated metanephrines

## Explanations:

- All adrenal adenomas need further work up to clarify the functional status. There should be an investigation for Cushing syndrome and pheochromocytoma, and if the patient has hypertension, then there should be an investigation for aldosterone excess.
- The majority of adrenal adenomas are non-functioning, but the hormonal workup is considered mandatory especially for safety purposes before any surgical or invasive intervention takes place.
- Biopsy of the adrenal lesion is indicated in very rare cases when there is a suspicion of metastatic disease from a known or very infrequently unknown primary cancer.
- Adrenal lesions which exhibit less than 10 HU (Hounsfield Units) on non-contrast CT scan strongly suggest a benign adenoma and there is no need for further imaging.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Adrenal Adenoma

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## Question 136:

A 47-year-old female patient who presented with a lump in the neck, lethargy, dyspnea, and dysphagia. Past medical history is significant for hypothyroidism. FNA was negative for malignancy. Excision biopsy was consistent with Riedel's thyroiditis. Seven years later, she presented with a large goiter and dyspnea. CT of the neck showed tracheal narrowing but no displacement. The patient refused any further surgeries. What is the next best step in management?

## Choices:

1. Observe and repeat the CT scan in 6 months
2. Start treatment with prednisone
3. Start treatment with mycophenolate
4. Start treatment with tamoxifen

## Answer: 2 - Start treatment with prednisone

## Explanations:

- Riedel' thyroiditis is characterized by replacement of thyroid parenchyma with dense fibrous tissue which involves extra-thyroidal tissues. It often presents with a hard neck mass and obstructive symptoms (dyspnea, dysphagia, and hoarseness).
- Surgical management is done to alleviate obstructive symptoms. However, surgical extirpation is difficult as the tissue planes are obliterated due to fibrosis.
- Glucocorticoids are the mainstay of medical management in Riedel's thyroiditis.
- Tamoxifen and mycophenolate have been used in glucocorticoid unresponsive cases of Riedel's thyroiditis.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Riedel Thyroiditis

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## Question 137:

A 50-year-old male is interested in a vigorous exercise program consisting of 45 minutes of stationary biking three times per week between 9 and 10 p.m. His current insulin regimen consists of 4 units of regular insulin before lunch, 6 units of regular insulin before dinner, and 4 units of long-acting insulin before bedtime. On the first day of his exercise program, his blood glucose before dinner at 6 o'clock is 124 mg/dL. He injects his usual dose of 6 units of regular insulin. His blood glucose is 134 mg/dL before biking and 138 mg/dL before bedtime. He awakens at 3 a.m. with severe hypoglycemia. What should he do to minimize the risk of hypoglycemia?

## Choices:

1. Decrease his dose of regular insulin before his evening meal
2. Stop vigorously exercising
3. Exercise during the morning
4. Reduce his long-acting insulin dose at bedtime

## Answer: 1 - Decrease his dose of regular insulin before his evening meal

## Explanations:

- Exercise is considered a cornerstone of diabetes management. During vigorous exercise, muscles are depleted of their stored glycogen.
- For several hours after exercise, muscles take up glucose to replenish the glycogen stores. This causes a lowering of blood glucose levels.
- Changing the time of exercise will not decrease the risk of hypoglycemia. To minimize the risk of hypoglycemia, this patient should reduce the dose of his regular insulin before his evening meal.
- He also should eat a larger than usual bedtime snack. Frequent monitoring of blood glucose levels after exercise will allow him to make an appropriate adjustment to his insulin regimen before his next workout.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Diabetes Mellitus And Exercise

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 138:

A 16-year-old girl presents to the clinic for follow-up. She weighed 58 kg and was diagnosed with type 1 diabetes three years ago when her glucose on routine bloodwork was noted to be 158 mg/dL with hemoglobin A1c (HbA1c) 6.8%. She is currently being managed with insulin glargine 10 units, but she has never required prandial insulin. Her current HbA1c is 6.5%. Which of the following possible features, if present, is most suggestive of a potential diagnosis other than type 1 diabetes?

## Choices:

1. Her brother, father, and paternal uncle also had a diagnosis of diabetes made in childhood or young adulthood and are managed with basal and prandial insulin
2. Her pancreatic autoantibodies were negative at the time of diabetes diagnosis
3. Her weight at birth was low
4. Her brother was diagnosed with diabetes at age 15 years when he presented with ketoacidosis and HbA1c of 11%

## Answer: 2 - Her pancreatic autoantibodies were negative at the time of diabetes diagnosis

## Explanations:

- Maturity-onset diabetes of the young (MODY) has several forms but is suggested by absent pancreatic autoantibodies, relatively low exogenous insulin need beyond the typical "honeymoon period," and family history of similar presentation before age 30.
- There are several forms of MODY, of which MODY3 is most common, representing 30% to 60% of cases, and is due to a mutation in the HNF1-alpha gene on chromosome 12. MODY3 is often sulfonylurea-responsive though it may progress to requiring insulin later in life. Making the appropriate diagnosis may spare years of unnecessary insulin injections.
- Patients with certain types of MODY (like 1, 12, or 13) might have been exposed to higher levels of insulin in utero, causing transient hypoglycemia and also macrosomia, and high birth weight.
- MODY does not present with ketoacidosis, and the HbA1c is in the lower abnormal range, usually less than 8%.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Maturity Onset Diabetes in the Young

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## Question 139:

A 65-year-old male with no significant past medical history presents with complaints of a 6-week history of diarrhea and abdominal cramping. He denies nausea, vomiting, or hematochezia, but endorses a 12-pound (5 kg) weight loss. The physical examination is remarkable for flushing of the face, bilateral expiratory wheezes, and a right-sided systolic murmur. Twenty-four-hour urine testing reveals elevated levels of 5-hydroxyindoleacetic acid. Abdominal CT reveals a mass in the tip of the appendix. What is indicated by the presence of these findings?

## Choices:

1. Presence of tumor in the appendix only
2. Tumor invasion through the serosa of the appendix
3. Metastasis of tumor to the liver
4. Tumor production of dopamine

## Answer: 3 - Metastasis of tumor to the liver

## Explanations:

- The most common cancer of the appendix is a carcinoid tumor, often 2 to 3 cm in size at the distal tip of the appendix. The neoplasm is generally asymptomatic and found incidentally on abdominal CT or appendectomy. Sometimes, patients present with carcinoid syndrome.
- Carcinoid tumors are of neuroendocrine origin and produce serotonin and other vasoactive substances. Thus, carcinoid syndrome refers to the excess of serotonin which can cause flushing, wheezing, diarrhea, and right-sided heart murmurs. 5-hydroxyindoleacetic acid is the primary metabolite of serotonin, and urine levels can be used to assess for the presence of a carcinoid tumor.
- In a patient with a carcinoid tumor in the gastrointestinal tract, symptoms of carcinoid syndrome indicate metastasis, most commonly to the liver. This is because the liver metabolizes 5-hydroxytryptamine before it can reach systemic circulation and cause vasoactive effects. If it has metastasized, excess serotonin spills into the circulation and causes wheezing, flushing, diarrhea, and right-sided heart murmurs. Thus, tumor location determines whether carcinoid syndrome appears.
- Carcinoid syndrome rarely causes left-sided valvular disease because of pulmonary metabolism of the hormonal substances. Left-sided valvular disease in the context of carcinoid syndrome can occur with a patent foramen ovale.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Intestinal Carcinoid Cancer

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## Question 140:

A 55-year-old white female presents to the clinic with a recent history of a migrating cyclic rash located in her perineum and lower extremities. This was previously diagnosed as cellulitis and treated with antibiotics without improvement. She also admits to a recent unintentional 15-pound (7 kg) weight loss, fatigue, and diarrhea. She has not experienced these symptoms before now. Necrolytic migratory erythema is suspected. Serum glucagon level returns highly elevated at 1200 pg/nL. What labs or imaging tests should be ordered next?

## Choices:

1. Liver function tests, erythrocyte sedimentation rate, and thyroid stimulating hormone
2. Fasting serum glucose, CBC with differential, and abdominal CT scan
3. Urinalysis, stool ova and parasites, and CBC with differential
4. Serum calcitonin level, MRI of the brain, and serum gastrin level

## Answer: 2 - Fasting serum glucose, CBC with differential, and abdominal CT scan

## Explanations:

- Necrolytic migratory anemia is associated with glucagonoma.
- Elevated serum glucagon results in hyperglycemia and diabetes mellitus.
- Glucagonoma is associated with a normocytic normochromic anemia.
- Abdominal CT scan is used to localize the glucagonoma, which is usually located in the tail of the pancreas.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Necrolytic Migratory Erythema

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## Question 141:

A 76-year-old female with known osteopenia presents to you for a checkup. She reports she is intolerant of daily alendronate and raloxifene. Her last dual-energy x-ray absorptiometry (DEXA) was obtained 15 months ago. She is otherwise healthy. Her risk factors include a personal history of fracture from a ground level fall and her weight of 123 pounds. You order a repeat DEXA scan. Her lumbar spine T-score is -2.16, and her hip T-score is -2.49. Her lumbar spine T-score has decreased by 3.2%, and her hip has decreased by 3.8%. What is your recommendation?

## Choices:

1. Her T-score reflects osteopenia, so you recommend calcium, vitamin D3, alcohol cessation, and exercise.
2. Because she cannot tolerate alendronate or raloxifene, you prescribe estrogen therapy for her osteopenia
3. Intravenous zoledronic acid for treatment of her osteopenia
4. Weekly alendronate instead of daily

## Answer: 3 - Intravenous zoledronic acid for treatment of her osteopenia

## Explanations:

- Side effects of oral bisphosphonates are the same whether weekly or daily. Intravenous bisphosphonates are tolerated better than oral.
- Estrogen is not recommended for treatment of osteoporosis or osteopenia.
- While she would benefit from calcium, vitamin D, and exercise, she also needs treatment with pharmacologic therapy. This is due to her multiple risk factors, a history of a prior fracture, and her continued bone loss.
- The average bone loss in a postmenopausal woman is 1% to 2% per year.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Osteoporosis

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## Question 142:

A 43-year-old male recently returned from a trip to South America 2 weeks ago. He has a past medical history of non-insulin dependent type 2 diabetes mellitus, hypertension, and depression. He has always been very compliant with his medications. While talking about his vacation, he casually mentions he continued monitoring his glucose, which was consistently higher than normal, despite taking medications as prescribed. Patient states he attributed it to eating a little more since he was on vacation. On this visit, he is complaining of diarrhea, which is not relieved by over-the-counter antidiarrheal medication. Upon further questioning, he reports some weight loss and stomach pain, which began several months ago, but the pain has not been severe, and the patient was glad to be losing weight. Which of the following is the most likely cause of the patient's symptoms?

## Choices:

1. Worsening diabetes mellitus
2. Giardia lamblia infection
3. Somatostatinoma
4. Peptic ulcer disease

## Answer: 3 - Somatostatinoma

## Explanations:

- There are several clues in this stem which lead away from an infection and towards other pathology. The patient has several months of abdominal pain and weight loss, glucose intolerance, despite no change in medication and refractory diarrhea. These symptoms are most likely due to a somatostatinoma.
- Somatostatinoma's most commonly present with weight loss and stomach pain; however, it is possible to have somatostatinoma syndrome. This most commonly presents with diabetes mellitus, glucose intolerance, diarrhea, steatorrhea, and cholelithiasis.
- Somatostatinomas can have a variable presentation due to the various physiologic effects of the hormone in multiple organs of the body. Understanding the physiology of somatostatin and how it effects organs will help catch some of the more peculiar and seldom seen symptoms of somatostatinoma, such as gallstones, jaundice, bowel obstruction, and achlorhydria.
- Once somatostatin binds to its receptor, it produces its physiologic effect, which is primarily inhibition of various hormones. Acetylcholine, arginine vasopressin, cholecystokinin, epidermal growth hormone, glucagon, glucose-dependent insulinotropic peptide, gastrin, growth hormone, insulin, motilin, neurotensin, pancreatic polypeptide, secretin, serotonin, substance P, thyrotropin, and vasoactive intestinal polypeptide are all inhibited by the effects of somatostatin. The pancreas will have both endocrine and exocrine secretions inhibited. Finally, within the gastrointestinal system, somatostatin will inhibit salivary amylase, gastric acid, and gastrointestinal hormone secretions. It also delays gastric emptying, slows motility, inhibits absorption, and decreases splanchnic blood flow.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Somatostatinoma

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## Question 143:

A 65-year-old female with rheumatoid arthritis is on methotrexate 12.5 mg weekly and prednisone 7.5 mg daily. She is admitted for urosepsis. Her vital signs are blood pressure 86/52 mmHg, heart rate 120 beats per minute, temperature 38.9 C, respiratory rate 22 breaths per minute, and oxygen saturation 95% on room air. A complete blood count shows white blood cells 22,000 with a left shift and a hematocrit of 24%. Her electrolytes are normal, but the BUN is 45 mg/dL and creatinine is 2.2 mg/dL. She is started on appropriate antibiotics, but after 2 liters of fluids, she is still hypotensive with a central venous pressure of 20 cmH2O. What is the most appropriate treatment?

## Choices:

1. Transfuse two units of packed red blood cells
2. Continue crystalloids at 500 mL/hour
3. Start dopamine
4. Start intravenous hydrocortisone

## Answer: 4 - Start intravenous hydrocortisone

## Explanations:

- The patient is having an Addisonian crisis.
- She is steroid dependent and cannot adequately respond to the stress of sepsis with endogenous glucocorticoids.
- Continuing fluids would not be the best option. Her central venous pressure is high and fluids could precipitate congestive heart failure.
- If the hydrocortisone is not effective, pressors such as norepinephrine or dopamine may be needed.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Addisonian Crisis

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## Question 144:

A 26-year-old female patient referred for evaluation of galactorrhea. She has no significant past medical history and is not on any medications. Her menstrual cycles are regular. She first noticed the milk discharge a year ago. Of late, she has been having spontaneous galactorrhea and has been affecting her social life. Physical examination is unremarkable. Prolactin level was normal at 15 (0-25 ng/dl). Basic metabolic panel, thyroid stimulating hormone (TSH), pregnancy test were all unremarkable. Magnetic resonance imaging of the pituitary gland is normal. What is the next step in management?

## Choices:

1. Repeat prolactin levels in 1 month
2. Serial dilution of prolactin to assess "hook effect"
3. Start treatment with dopamine agonists
4. Refer to psychiatry for treatment of depression

## Answer: 3 - Start treatment with dopamine agonists

## Explanations:

- Galactorrhea is non-physiologic lactation. Although it is mostly associated with hyperprolactinemia it can be seen with normal levels of prolactin as well.
- If the galactorrhea is socially not acceptable to the patient then treatment with dopamine agonists can be initiated.
- Other causes of hyperprolactinemia include renal failure, hypothyroidism, nipple stimulation, and chest wall lesions
- Galactorrhea occurs in up to 32% of women. It also occurs in men, newborns, and adolescents of both sexes.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Galactorrhea

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## Question 145:

A 30-year-old man with no past medical history presents to the emergency department with multiple episodes of a generalized tonic-clonic seizure. His seizure stopped upon arrival. His vital signs are stable. Blood work shows a plasma glucose concentration of 50 mg/dL. His CT head is negative for acute disease. EEG is negative for seizure activity. He has no family history of endocrinopathies. Further bloodwork shows insulin level 7 microU/mL, C peptide level 1 ng/mL, proinsulin level 8 pmol/L, beta-hydroxybutyrate level 0.3 mmol/L, and a negative sulfonylurea. CT abdomen shows a 1 cm solid mass in the pancreas, which enhanced after contrast. He undergoes surgical resection of the mass and follows up with endocrinology six months post resection. He has had no recurrence of the tumor on repeat imaging. He denies any recurrent symptoms. Which of the following is the next best step in the management of this patient?

## Choices:

1. Follow up with endocrinology again 12 months post resection
2. Follow up with endocrinology again 24 months post resection
3. Undergo genetic testing
4. Have family members screened for insulinomas

## Answer: 3 - Undergo genetic testing

## Explanations:

- It is recommended that all young patients with insulinoma undergo genetic testing.
- MEN1 syndrome should be considered in patients with either family or/and a personal history of other endocrinopathies.
- Insulinoma patients without MEN1 should have follow-ups at 3-6 months post resection.
- Biochemical testing and imaging studies should be repeated at follow-ups. If cured, patients can be followed up as needed if there is recurrence of symptoms.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Insulinoma

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## Question 146:

A 17-year-old patient was involved in a motor vehicle accident. He was found to be hypotensive at the scene of the accident and had to be resuscitated. He suffered multiple injuries to his lower extremities and required numerous surgeries and prolonged mechanical ventilation. He was started on a high concentration of enteral glucose feeds on a 24-hour protocol. Four weeks later, he is still dependent on the mechanical ventilator, but his chest x-ray remains clear. He has profound respiratory muscle weakness and the MRI shows significant thinning of the diaphragm. Which of the following is the most likely cause of his muscle weakness?

## Choices:

1. Hypocalcemia
2. Hypophosphatemia
3. Zinc deficiency
4. Hypernatremia

## Answer: 2 - Hypophosphatemia

## Explanations:

- Low phosphate levels can cause significant weakness of skeletal and smooth muscle, which can affect the eyes as well as the diaphragm.
- Respiratory insufficiency in patients on ventilators is common after hypophosphatemia. Impaired cardiac contractility can also occur and usually reverses when phosphate is reinstituted in the diet.
- Administering high carbohydrate diets can lead to a lowering of phosphate by stimulating insulin release. Insulin moves phosphate into the cells.
- Diabetic ketoacidosis is another important cause of hypophosphatemia. However, routine replacement of phosphate in these patients has not been shown to reduce morbidity or mortality.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hypophosphatemia

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## Question 147:

A 59-year-old female with a past medical history of diabetes mellitus type 2 and hypertension presents to the clinic for follow-up. She reports feeling fatigued on most days but otherwise has no complaints. She reports compliance with medications and reports good glycemic at home. She is on empagliflozin, metformin, and lisinopril at home. Recent blood work reveals normal renal function, hemoglobin of 9.9 g/dL with a mean corpuscular volume of 78 femtolitres, and a hemoglobin A1c of 8.5%. Hemoglobin electrophoresis is normal. Elevated red cell distribution width with microcytosis and anisopoikilocytosis on the peripheral smear is noted. What is the next step in the management of this patient?

## Choices:

1. Increase empagliflozin dose and recheck hemoglobin A1c in 3 months
2. Add insulin therapy and recheck hemoglobin A1c in 3 months
3. Start iron supplements, refer to colonoscopy and recheck A1c in 3 months
4. Check serum iron level and binding capacity and follow up in 1 month

## Answer: 3 - Start iron supplements, refer to colonoscopy and recheck A1c in 3 months

## Explanations:

- A low mean corpuscular volume with an elevated red-cell distribution width and a peripheral blood smear that shows microcytosis with anisopoikilocytosis is diagnostic of iron deficiency anemia.
- Iron deficiency anemia can falsely raise hemoglobin A1c levels. Patients with good glycemic control at home but elevated hemoglobin A1c in the setting of microcytic anemia should be evaluated for the cause of iron deficiency anemia. Hemoglobin A1c can improve with iron supplementation.
- Vitamin B12 deficiency and folate deficiency have also been known to increase hemoglobin A1c levels.
- Increasing the dose of empagliflozin or adding insulin will predispose to hypoglycemia and would be inappropriate at this time, especially with controlled home glucose readings.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hemoglobin A1C

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## Question 148: A 56-year-old female is in the hospital 3 days after an aneurysmal subarachnoid hemorrhage. She has hyponatremia with serum sodium of 130 meq/L with decreased skin turgor and elevated hematocrit. Her urine sodium is elevated. Her vital signs are unremarkable and chloride is within the reference range. The patient is conscious, alert, and well oriented to time, place, and person. What is the most rational initial step in the management of the patient presenting with such clinical characteristics?

## Choices:

1. Fluid supplementation with isotonic saline
2. Fluid restriction
3. Nimodipine
4. Hypertonic saline

## Answer: 1 - Fluid supplementation with isotonic saline

## Explanations:

- Cerebral salt wasting syndrome is characterized by hyponatremia with elevated urine sodium in a hypovolemic state, as evidenced by decreased skin turgor, hypotension, decreased central venous pressure, and elevated hematocrit.
- Syndrome of inappropriate secretion of antidiuretic hormone (SIADH) is characterized by hyponatremia with elevated urine sodium in a hypervolemic to euvolemic state.
- Cerebral salt wasting syndrome can be differentiated from SIADH by fluid status. In cerebral salt wasting, the patient is hypovolemic. In SIADH, the patient is hypervolemic to euvolemic.
- Cerebral salt wasting syndrome is treated with fluid resuscitation. SIADH is treated with fluid restriction.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Cerebral Salt Wasting Syndrome

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## Question 149:

A 17-year-old female known to have diabetes mellitus type 1 presents to the emergency department with a history of several hours of vomiting and abdominal pain. She complains of feeling tired but is alert and orientated and does not like having the IV cannula placed in her hand. Venous blood gas on admission shows pH 7.12, PCO2 3.4 kPa, bicarbonate 12 mmol/L, and base excess minus 14 mmol/L. She is treated with IV fluids and insulin. About 8 hours after starting treatment, her venous pH is 7.27, PCO2 3.9 kPa, bicarbonate 16 mmol/L, base excess minus 8 mmol/L, and lactate is 2.7 mmol/L. She continues to complain of feeling tired and now has a headache. The nurse caring for the patient reports that the patient has become drowsy and less alert over the past 2 to 3 hours. What should be done?

## Choices:

1. Repeat all the blood investigations to ascertain if she has any serum electrolyte abnormalities. While awaiting the results of these, treat the patient with painkillers.
2. Increase the amount of fluid and insulin as clinical and laboratory assessments indicate that the patient is not improving.
3. Consider cerebral edema as the possible cause of clinical deterioration, review the clinical and laboratory status of the patient thoroughly, and consider the need for early treatment of cerebral edema.
4. Prescribe pain relief for the headache and review in 2 hours to see if this has been helpful

## Answer: 3 - Consider cerebral edema as the possible cause of clinical deterioration, review the clinical and laboratory status of the patient thoroughly, and consider the need for early treatment of cerebral edema.

## Explanations:

- The patient has diabetic ketoacidosis. Her clinical condition has deteriorated and is cause for concern. Blood investigations are important but clinical assessment indicates that neurologic status is of concern. Therefore, cerebral edema, a recognized serious complication of diabetic ketoacidosis, needs to be considered.
- Cerebral edema is a known complication of diabetic ketoacidosis. It is more common in pediatric than in adult patients.
- In this clinical scenario, there are neurologic symptoms such as a headache and lethargy. The patient needs careful clinical assessment, including neurologic status and continued neurologic observations.
- Headache is a neurologic symptom that should prompt consideration of cerebral edema and clinical assessment before any treatment.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Pediatric Diabetic Ketoacidosis

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 150:

A 65-year-old male with a past medical history positive for type 2 diabetes, hyperlipidemia, and bipolar disorder arrives at the clinic complaining of shortness of breath. After careful evaluation and diagnostic testing, the patient is found to have pulmonary artery hypertension. The provider wants to put him on a medication that would antagonize endothelin-1. Which of the following mechanisms of action of a possible preexisting medications the patient is already taking would be contraindicated if the physician prescribes this new medication to treat his pulmonary artery hypertension?

## Choices:

1. Inhibition of HMG CoA reductase
2. Inhibit potassium efflux from pancreatic beta cells
3. 5HT-1 agonist
4. Inhibiting IMPase

## Answer: 2 - Inhibit potassium efflux from pancreatic beta cells

## Explanations:

- Glyburide is contraindicated when taking bosentan. Glyburide acts by inhibiting potassium efflux from pancreatic beta cells; to allow the release of insulin.
- Glyburide is acted upon by the CYP P450 enzyme system. The use of glyburide with bosentan may lead to dangerously elevated levels of bosentan. These high levels may increase the risk of adverse effects such as hypotension, syncope, flushing, and hepatic dysfunction.
- When using glyburide and bosentan together may also lead to an increased risk of hepatotoxicity and an elevation in liver enzymes.
- Statins work by inhibiting HMG CoA reductase, thereby limiting the production of cholesterol and LDL. Patients with elevated lipid profile may benefit from taking statins to decrease their risk of developing a heart attack or stroke. Triptans, which are used in the treatment of migraines, work by agonizing the 5HT-1 receptors. These medications are not contraindicated with the use of bosentan. Lithium is used in the treatment of bipolar 1. Although the mechanism of which it aids with mood stabilization is not clear, the mechanism of action proposed is by inhibiting inositol triphosphate. Statins, triptans, and lithium are not contraindicated, nor do they increase the risk of adverse effects when taking bosentan. Of the answer choices, only glyburide is contraindicated with the use of bosentan. Another medication contraindicated with the use of bosentan is cyclosporin A because it may lead to an increased plasma level of bosentan.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Bosentan

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 151: A 47-year-old male presents to the clinic with symptoms of episodic hypertension, palpitations, headaches, tachycardia, and sweating. His symptoms are not present at the time of examination. The metabolites of which of the following are most likely to be present following a 24-hour urine sample?

## Choices:

1. Serotonin
2. Insulin
3. Metanephrine
4. Vasoactive intestinal peptide

## Answer: 3 - Metanephrine

## Explanations:

- Pheochromocytoma is a tumor of chromaffin cells. Chromaffin cells release catecholamines such as norepinephrine and epinephrine.
- This patient's history is classic for a pheochromocytoma. His symptoms are episodic and include headaches, palpitations, and diaphoresis in association with hypertension.
- A 24-hour urine sample will reveal increased metanephrine, the metabolite of epinephrine.
- Other metabolites include vanillylmandelic acid, homovanillic acid, and normetanephrine.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Epinephrine

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## Question 152:

A 16-year-old female patient presents with a complaint of never having menstruated. She is otherwise healthy. Her vitals are notable for a blood pressure of 145/85 mmHg. She is Tanner stage 1. Further workup reveals normal female genitalia, and routine labs show only hypokalemia. Further studies reveal elevated ACTH and 11-deoxycortisol. Cortisol, 17-hydroxyprogesterone, estrogen, and progesterone are low. What is the most likely enzyme deficiency in this patient?

## Choices:

1. 21-hydroxylase
2. 17-hydroxylase
3. 3-beta hydroxylase
4. 11-beta hydroxylase

## Answer: 2 - 17-hydroxylase

## Explanations:

- 17-hydroxylase deficiency is a rare form of congenital adrenal hyperplasia.
- 17-hydroxylase deficiency is not identified on newborn screen like the more common 21-hydroxylase deficiency and is often not diagnosed until puberty.
- Lack of sexual maturation, hypertension, and hypokalemia are the common presenting features of 17-hydroxylase deficiency.
- 17 hydroxylase deficiency-related delayed maturation should be treated with appropriate hormone replacement to prevent complications.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### C 17 Hydroxylase Deficiency

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 153: A 52-year-old female with a BMI of 41 kg/m2 and a history of type 2 diabetes mellitus presents to the office for a consultation. She says she has a friend who had successful weight loss after her "sleeve," and she would like to know what her options are for weight loss surgery. She also has severe gastroesophageal reflux. What should she be told?

## Choices:

1. While sleeve gastrectomy and Roux-en-y gastric bypass are both options for her, sleeve gastrectomy has much better results regarding diabetes remission after surgery
2. While both sleeve gastrectomy and Roux-en-y gastric bypass are options for her, the latter results in less reflux
3. Both surgeries are contraindicated given her BMI is greater than 40 kg/m2
4. Roux-en-y gastric bypass is contraindicated in patients with type 2 diabetes

Answer: 2 - While both sleeve gastrectomy and Roux-en-y gastric bypass are options for her, the latter results in less reflux

## Explanations:

- While long-term data comparing weight loss results between laparoscopic sleeve gastrectomy (LSG) and LRYGB are limited, LRYGB has been shown to yield a slightly greater weight loss than LSG. In a patient over 50, LRYGB would be a more effective surgical therapy.
- Some studies have shown that diabetes remission is greater after LRYGB than after LSG, but this difference does not persist past the first year.
- With the gastric sleeve, the patient has the option of undergoing revision surgery at a later time to convert to Roux-en-y gastric bypass.
- LRYGB will likely yield better results for her reflux. LRYGB is more extensive, and the risk of complications is greater than with LSG. All this should be explained to the patient as well when presenting them with surgical options.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Obesity Surgery Indications And Contraindications

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 154:

A previously healthy 17-year-old boy presents to the emergency department with a high-grade fever, malaise, neck rigidity, and a petechial skin rash. He reveals that he had developed an upper respiratory tract infection three days ago. Today, in the emergency department, he has a blood pressure of 70/40 mmHg, a heart rate of 120 beats per minute. Further evaluation with labs show a white blood cell count of 22,000 per microliter, sodium 120 mEq/L, potassium 5.8 mEq/L, chloride 89 mEq/L, blood urea nitrogen 34 mg/dL, creatinine 2.0 mg/dL, and glucose 50 mg/dL. Which of the following is most likely to be associated with his condition?

## Choices:

1. Disseminated intravascular coagulation
2. Isolated thrombocytopenia
3. Respiratory acidosis
4. Metabolic alkalosis

## Answer: 1 - Disseminated intravascular coagulation

## Explanations:

- The patient has hypotension with hyperkalemia, hyponatremia, and hypochloremia. These laboratory abnormalities and petechial skin rash suggest that he has Waterhouse-Friderichsen syndrome (WFS).
- The syndrome is caused by meningococcus. Disseminated intravascular coagulation is a complication associated with meningococcemia.
- Other conditions associated with meningococcemia petechial rash, neurologic manifestations, and pupura fulminans.
- Metabolic acidosis due to adrenal insufficiency is seen on arterial blood gas analysis.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Waterhouse-Friderichsen Syndrome

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 155: Which of the following tests would distinguish primary from secondary hypogonadism in a patient with low testosterone levels?

## Choices:

1. Cortisol
2. Luteinizing hormone
3. Thyroid stimulating hormone
4. Aldosterone

## Answer: 2 - Luteinizing hormone

## Explanations:

- Elevation of luteinizing hormone (LH) or follicle stimulating hormone (FSH) indicates primary hypogonadism.
- Normal or reduced FSH or LH indicates secondary hypogonadism.
- Testosterone is a male sex hormone and an anabolic steroid. Testosterone assists in the development of male reproductive tissues such as the testis and prostate, as well as promoting secondary sexual characteristics such as increased muscle and bone mass and body hair growth. Testosterone is involved in health and well-being and the prevention of osteoporosis. It exerts its action through binding to and activation of androgen receptors. Testosterone is secreted primarily by the testicles of males and the ovaries of females. Small amounts are secreted by the adrenal glands. In adult males, levels of testosterone are about 7 to 8 times greater than adult females. As the metabolic consumption of testosterone in males is greater, the daily production is about 20 times greater in men. Females are also more sensitive to testosterone.
- Testosterone is used to treat males with too little testosterone production, certain forms of breast cancer, and gender dysphoria in men.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hypogonadism

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## Question 156: A middle-aged man is noted over 20 years to have protrusion of his brows, increasing foot size, and coarsening of his facial features. Which pair of hormones regulates the responsible hormone in normal situations?

## Choices:

1. Luteinizing hormone and human chorionic gonadotropin
2. Somatostatin and growth hormone-releasing hormone
3. Dopamine and growth hormone
4. Prolactin and growth hormone-releasing hormone

## Answer: 2 - Somatostatin and growth hormone-releasing hormone

## Explanations:

- The patient most likely has a growth hormone-secreting pituitary adenoma, causing acromegaly.
- Hypothalamic GHRH (growth hormone-releasing hormone) regulates growth hormone synthesis.
- Hypothalamic somatostatin regulates pulsatile secretion of growth hormone.
- Acromegaly results from excess growth hormone after the growth plates have closed. Typically there is initial enlargement of the hands and feet. There may also be enlargement of the forehead, jaw, and nose. Other symptoms include joint pain, thicker skin, deep voice, headaches, and problems with vision. Complications include diabetes mellitus type 2, sleep apnea, and hypertension.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Acromegaly

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## Question 157: A 5-year-old male presents to the clinic with abdominal pain, lipemia retinalis, and hepatosplenomegaly. His triglycerides are 3500 mg/dl, and his serum lipase is increased 3- fold. What is the most likely genetic cause of the patient's chylomicronemia syndrome?

## Choices:

1. LDL Receptor deficiency
2. Lipoprotein lipase deficiency
3. Apoprotein CIII deficiency
4. ApoE deficiency

## Answer: 2 - Lipoprotein lipase deficiency

## Explanations:

- LPL deficiency is the commonest cause of familial chylomicronemia in children.
- It is an autosomal recessive disorder and due to homozygous or compound heterozygous mutations of LPL.
- It can result in severe chylomicronemia which increases the risk for pancreatitis.
- It invariably presents in infancy or childhood.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Biochemistry, Chylomicron

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 158: An elderly patient with several risk factors for stroke presents for a routine check-up. He would like to take omega 3 polyunsaturated fatty acids to prevent a stroke. What are the American Heart Association recommendations on this topic?

## Choices:

1. If taken regularly the risk of stroke can be decreased
2. There is no proven benefit
3. The omega 3 fatty acids can only prevent primary and not secondary stroke
4. Both primary and secondary stroke can be prevented

## Answer: 2 - There is no proven benefit

## Explanations:

- The American Heart Association (AHA) has stated that based on results from randomized studies, there is no evidence to support the use of omega 3 polyunsaturated fatty acid supplementation for the prevention of atrial fibrillation in open-heart surgery patients.
- However, the AHA advisory does conclude that consumption of PUFAs may reduce the risk of ischemic heart disease when the patient also undertakes lifestyle changes.
- Overall, the prevalence of coronary artery disease is only moderately lowered by regular intake of PUFA.
- So far, there is no significant impact of PUFA on stroke or cancer.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Omega-3 Fatty Acids

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## Question 159: A 36-year-old female with a past medical history of anxiety presents to your clinic for complaints of worsening anxiety despite pharmacologic treatment, diaphoresis, palpitations, increased bowel movement frequency, and weight loss despite no change in her diet or exercise routines. A basic chemistry panel is unremarkable, and thyroid stimulating hormone and free T4 levels are within the normal reference range. You have a strong suspicion that the patient is experiencing thyrotoxicosis despite the normal free T4 level. What is the likely cause of this patient's symptoms?

## Choices:

1. Surreptitious thyroid hormone use
2. Thyroid malignancy
3. T3 toxicosis
4. T4 toxicosis

## Answer: 3 - T3 toxicosis

## Explanations:

- Most of the thyroid hormone produced by the thyroid gland consists of the T4 (thyroxine) hormone.
- Triiodothyronine (T3) is the biologically more potent form of thyroid hormone, and the majority of T4 to T3 conversion takes place extra-thyroidally. T4 to T3 conversion is facilitated by the presence of deiodinase enzymes.
- A patient with suspected thyrotoxicosis and a normal free T4 level should have their T3 level checked due to potential T3 toxicosis.
- T3 toxicosis typically presents with normal free T4 but elevated T3. Management of T3 toxicosis can include propylthiouracil, which inhibits T4 to T3 conversion in peripheral tissues.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hyperthyroidism

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## Question 160: A diabetic patient inquires as to what benefits he will receive from regular exercise. What effects can a Diabetes Mellitus type 2 patient expect to experience?

## Choices:

1. Exercise is not effective at mitigating metabolic problems inherent in diabetes.
2. Carbohydrate uptake is increased and may lead to hypoglycemia
3. Exercise may impair peripheral utilization of glucose, leading to failure to thrive
4. Hyperglycemia may occur due to increased gluconeogenesis and more insulin will be needed

## Answer: 2 - Carbohydrate uptake is increased and may lead to hypoglycemia

## Explanations:

- Exercise is beneficial to diabetic patients and should be encouraged.
- Glucose may need to be monitored more frequently with exercise due to increased sensitivity and uptake in the muscles.
- Exercise may improve peripheral utilization of glucose and may lead to a decrease in insulin needs.
- Hypoglycemia is a risk due to increased peripheral glucose utilization associated with exercise. Exercise has numerous benefits for metabolic disease such as diabetes mellitus.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Therapeutic Exercise

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## Question 161:

A 26-year-old woman is evaluated for a lump in her neck. She discovered the lump a week ago while showering. The patient feels well and has no associated pain, fever, night sweats, or weight changes. Her medical history is unremarkable, although she has had irregular menses for a year since insertion of an intrauterine device. The patient does not use tobacco, alcohol, or illicit drugs. Her mother died during surgery for thyroid cancer. Blood pressure is 133/80 mm Hg and pulse are 78/min. On examination, there is a palpable 2-cm nodule in the right thyroid lobe. The remainder of the examination, including chest, abdomen, extremities, and skin, is normal. Serum TSH and calcium levels are normal, and calcitonin is elevated. Ultrasound-guided aspiration biopsy reveals malignant cells. Which of the following tests is the best next step in the evaluation of this patient?

## Choices:

1. Serum prolactin assay
2. Plasma fractionated metanephrine assay
3. Insulin-like growth factor-1
4. The aldosterone-renin activity ratio

## Answer: 2 - Plasma fractionated metanephrine assay

## Explanations:

- This patient with a malignant thyroid mass elevated serum calcitonin level, and family history of thyroid malignancy likely has an inherited form of medullary thyroid cancer (MTC). MTC is a calcitonin-producing tumor arising from neuroendocrine parafollicular C cells of the thyroid gland. Although most MTC is sporadic, approximately one-third of MTC is inherited as a component of multiple endocrine neoplasias (MEN) types 2A and 2B. Serum prolactin is the screening test for prolactin-secreting pituitary tumors. Pituitary tumors occur in MEN1 but are not a feature of MEN2.
- MEN2A and MEN2B are associated with pheochromocytoma, which can be asymptomatic at the time of diagnosis but cause life-threatening hypertensive crisis during surgical procedures (e.g., thyroidectomy). In light of this risk, most patients with MTC should undergo RET mutation testing and screen for pheochromocytoma with a plasma fractionated metanephrine assay. If found, pheochromocytoma should be resected before thyroidectomy.
- Serum insulin-like growth factor-1 is the screening test for growth hormone-secreting pituitary tumors. Pituitary tumors occur in MEN1 but are not a feature of MEN2.
- The aldosterone-renin activity ratio can help evaluate hyperaldosteronism (e.g., hypertension, hypernatremia, hypokalemia). This patient has no such manifestations. Also, adrenocortical tumors are uncommon in MEN syndromes, with biochemical testing recommended only in patients with manifestations of excessive hormonal production.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Multiple Endocrine Neoplasias Type 2

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## Question 162: Which of the following findings goes along with low testosterone level caused by testicular atrophy?

## Choices:

1. Low gonadotropin-releasing hormone
2. Absent follicle stimulating hormone
3. High luteinizing hormone
4. Reduced 5 alpha-reductase activity

## Answer: 3 - High luteinizing hormone

## Explanations:

- Testicular atrophy leads to decreased testosterone level and high luteinizing hormone and follicle stimulating hormone.
- 5 alpha-reductase levels may not be low but dihydrotestosterone should be low in testicular atrophy.
- Low gonadotropin-releasing hormone indicates central hypogonadism.
- Blood for testosterone should be taken in the morning hours when levels are highest. Normal total testosterone levels depend on the man's age but generally range from 240 to 950 ng/dL or 8.3 to 32.9 nmol/L. Some men with normal total testosterone have low free testosterone levels which may account for their symptoms. Men with low serum testosterone levels should have luteinizing hormone checked to determine why their testosterone levels are low and help select the most appropriate treatment. Treatment is often prescribed for total testosterone levels below 230 ng/dL with symptoms. If the serum total testosterone level is between 230 and 350 ng/dL, free testosterone should be checked as it is frequently low when the total is marginal.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hypogonadism

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## Question 163: A 40-year-old female with known colorectal cancer has been diagnosed with an APC gene mutation. Which of the following is the most appropriate recommendation for thyroid cancer screening in her son?

## Choices:

1. Annual thyroid ultrasound beginning at age 12
2. Annual thyroid exam beginning at age12
3. Annual thyroid ultrasound beginning at age 25
4. Annual thyroid exam beginning at age 25

## Answer: 4 - Annual thyroid exam beginning at age 25

## Explanations:

- A mutation of the APC gene is associated with Familial Adenomatous Polyposis (FAP). FAP is associated with a nearly 100% risk of developing colorectal cancer. It is also associated with increased risk of other tumors/malignancies, including thyroid cancer, gastric and duodenal polyps, desmoid tumors and hepatoblastoma.
- Patients with a family history of FAP should undergo sigmoidoscopy at the age of 12 to evaluate for polyposis. Surgical resection is performed when the polyp burden is no longer manageable with endoscopy resection.
- Other screening exams include an annual thyroid exam beginning at the age of 25 with consideration of annual thyroid ultrasound.
- Annual EGD should begin at twenty years of age to evaluate for gastric and duodenal polyps.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Familial Adenomatous Polyposis

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## Question 164:

A 25-year-old Asian man recently diagnosed with Graves disease presents to the emergency department with weakness. His current medications include propylthiouracil and propranolol. He went to the gym last evening and had a strenuous work-out and drank 32 oz of regular soda afterward. He woke up this morning and realized that he was so weak that he was unable to get up and walk. His blood pressure is 120/80 mmHg, the pulse is 82/min, respiratory rate is 16/min, and oxygen saturation is 96% on room air. Cranial nerve exams are normal. Motor exam reveals grade 3-4/5 weakness affecting all extremities. His weakness is worse in his proximal muscles. Deep tendon reflexes are 1+ all over. His sensory examination is normal. His routine labs showed normal CBC, serum sodium 140 mEq/L, potassium 2.8 mEq/L; while BUN and creatinine are normal. What is the most likely pathophysiological mechanism of his weakness?

## Choices:

1. Too much soda intake causes hemodilution leads to hypokalemia causing neuronal hyperpolarization and impaired generation of nerve and muscle action potential
2. Too much soda intake causes hemodilution leading to hypokalemia causing neuronal depolarization and impaired generation of nerve and muscle action potential
3. Strenuous exercise and too much soda intake cause potassium to enter cells leading to hypokalemia causing neuronal depolarization and impaired generation of nerve and muscle action potential
4. Strenuous exercise and too much soda intake cause potassium to enter cells leading to hypokalemia causing neuronal hyperpolarization and impaired generation of nerve and muscle action potential

## Answer: 4 - Strenuous exercise and too much soda intake cause potassium to enter cells leading to hypokalemia causing neuronal hyperpolarization and impaired generation of nerve and muscle action potential

## Explanations:

- This question describes a case of hypokalemic periodic paralysis precipitated by high carbohydrate intake and unaccustomed exercises.
- Hypokalemia causes neuronal and muscular hyperpolarization and decreased action potential generation.
- Hypokalemic periodic paralysis is associated with Grave's disease, especially among individuals from Asia.
- The hypokalemia is not dilutional.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Neuroanatomy, Neuron Action Potential

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## Question 165:

A 60-year-old female was found in a semi-comatose condition and brought to the emergency department. On physical exam, her height was 66 inches (167.6 cm), and her weight was 123 lb (55.8 kg) (BMI=19.9 kg/m2). Her blood pressure was 80/40 mm; her pulse rate was 50 beats/min with a temperature of 32 C (89.6 F). She was disoriented and lethargic. There was no palpable thyroid enlargement, but there was a scar on her neck. Laboratory test results demonstrate: hemoglobin 9 g/dl; hematocrit 25%; WBC count 9840 cells/mm3; platelet count 297,000 cells/mm3; creatinine 1.09 mg/dl sodium 126 meq/l; potassium 3.8 mEq/L; chloride 93 mEq/L; and bicarbonate 24.5 mEq/L. Chest radiography and CT brain didn't reveal any abnormalities. Blood and urine cultures were sent. Her family reveals she had rheumatoid arthritis and she was recently started on anti-TNF therapy. What is the least accurate statement for this condition?

## Choices:

1. Anti-TNF therapy can precipitate this condition
2. Hyponatremia and hypoglycemia are common manifestation
3. This condition is more common in women and in winter
4. Rapid rewarming is essential for survival

## Answer: 4 - Rapid rewarming is essential for survival

## Explanations:

- The patient has myxedema coma precipitated by anti-TNF therapy. The scar in her neck indicated that she had prior thyroid surgery. She is presenting with confusion, bradycardia hypothermia, hypotension, and hyponatremia. Patients on anti-TNF should have regular screening of thyroid function tests to avoid such complications. This condition is common in women and winter. Slow rewarming is required to prevent vasodilation and worsening of hypotension
- Other medications that can precipitate myxedema coma are amiodarone, lithium, sedatives, tranquilizers, anesthetics, opioids, Dilantin, rifampin, diuretics, and B blockers.
- Any surgery can precipitate myxedema coma given the effect on the pituitary-thyroid axis with decrease thyroid hormones secretion after surgery in response to stress. Also, the patient who had a prior thyroidectomy needs to be placed on levothyroxine replacement therapy for life.
- Since the patients are usually hypothermic, myxedema coma is more common in the winter months. This is explained by decrease heat production with age and hypothyroidism, in addition, to decrease thermoregulation with age.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Myxedema

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## Question 166: A 2-year-old male is brought to the clinic with a chronic history of diarrhea, vomiting, failure to thrive, fatty stools. Lipid profile shows very low LDL and triglyceride levels. A peripheral blood smear depicts non-uniformly spiculated RBCs. What is the most likely diagnosis?

## Choices:

1. Abetalipoproteinemia
2. Neuroacanthocytosis
3. Spur cell anemia
4. Whipple disease

## Answer: 1 - Abetalipoproteinemia

## Explanations:

- Also known as Basseg-Kornzweig Syndrome, abetalipoproteinemia is a disease that presents in infants with failure to thrive, diarrhea, vomiting, and fat malabsorption.
- Acanthocytes are characteristically visible on peripheral smear, with associated hemolytic anemia, reticulocytosis and raised bilirubin levels.
- Malabsorption of fat-soluble vitamins such as vitamin A, D, E and K results in the majority of the clinical manifestations.
- This patient does not have neurologic symptoms to point towards a diagnosis of acanthocytosis. Spur cell anemia is seen in chronic liver disease patients. Whipple disease is characterized by malabsorption, joint pain, neurological symptoms in the setting of a gastrointestinal infection with Tropheryma whipplei.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Acanthocytosis

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## Question 167: A 45-year-old patient presented with complaints of worsening headaches. On further questioning, she also admitted to weight gain over the past six months and an increase in shoe and hat size. On examination blood pressure was 146/92 mmHg and glucose fingerstick test was 11 mmol/L. What further testing should be done?

## Choices:

1. Prolactin
2. Insulin growth factor 1 (IGF1)
3. Follicle stimulation hormone(FSH)
4. Early morning serum cortisol

## Answer: 2 - Insulin growth factor 1 (IGF1)

## Explanations:

- The patient symptoms and signs are suggestive of acromegaly, in particular, the increase in shoe size which is not typical of other conditions such as Cushing disease that may be present with the other features of increased blood pressure, glucose intolerance, and weight gain.
- Growth hormone secretion is pulsatile during the day and also shows diurnal variation. Random levels may not reflect the presence of acromegaly.
- In acromegaly, IGF-I correlates well with growth hormone (GH) activity and nadir GH on oral glucose tolerance test (OGTT) and is the most sensitive and specific test in diagnosis, where serum IGF-I is persistently seen to be elevated to a range that is distinct from that in healthy individuals.
- Prolactin may be increased in a patient with acromegaly, but this is not diagnostic of acromegaly.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hyperpituitarism

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## Question 168: A 65-year-old female has a hip fracture and is diagnosed with osteoporosis. Laboratories show a calcium of 8.6 mg/dL, phosphate 2.9 mg/dL, creatinine 0.9 mg/dL, and 25-hydroxyvitamin D levels of 20 ng/mL (normal >30 ng/mL). A dual x-ray absorptiometry scan shows a t-score of negative 3. Which of the following is the best initial therapy for this patient?

## Choices:

1. Alendronate
2. Raloxifene
3. Calcium 1200 mg and vitamin D 400 international units daily
4. Intranasal calcitonin

## Answer: 1 - Alendronate

## Explanations:

- Patients with a t-score of negative 2.5 or less should receive treatment.
- Bisphosphonates are the best initial therapy for treating osteoporosis.
- They need to be accompanied by both calcium and vitamin D but at 1500 mg and 800 international units, respectively.
- Calcitonin and raloxifene increase bone density but not to the amount needed by this patient.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Osteoporosis

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## Question 169:

A 17-year-old White male patient presents to the clinic complaining of a scaling rash that seems to migrate. He states the rash has been present for the last three months and has waxed and waned in intensity. He also admits that trauma seems to aggravate the rash. Upon inspection, it is noticed that multiple erythematous lesions with serpiginous borders in various stages of healing are located in and around his axillae and lower extremities. He also admits having diarrhea and fatigue starting around the same time as the rash. What genetic condition should he be screened for?

## Choices:

1. Lynch syndrome
2. Autoimmune polyglandular syndrome type 1
3. Ataxia-telangiectasia syndrome
4. Multiple endocrine neoplasia type 1

## Answer: 4 - Multiple endocrine neoplasia type 1

## Explanations:

- Necrolytic migratory erythema is characteristic of glucagonoma.
- The rash of necrolytic migratory erythema is often located in areas of increased friction (e.g., intertriginous areas) and is aggravated by trauma.
- Glucagonomas can in rare cases be seen in association with multiple endocrine neoplasia type 1, often in younger patients.
- However, most glucagonomas are deemed to be sporadic.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Necrolytic Migratory Erythema

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## Question 170:

A 65-year old male who presents to the emergency department in septic shock secondary to wet gangrene of the left foot. He has a medical history of type 2 diabetes mellitus that is controlled on subcutaneous insulin detemir 40 units two times a day and subcutaneous insulin glulisine 10 units three times a day with meals. Vital signs are remarkable for blood pressure 60/40 mm Hg, heart rate 130 beats per minutes, temperature 101 degrees Fahrenheit. His body mass index is 45 Kg/m2. On initial laboratory work, he has a random blood glucose of 350 mg/dL, bicarbonate 24 meq/L, serum creatinine 2.4mg/dL, anion gap 18, lactic acid 6.0 mmol/L. Serum beta-hydroxybutyrate is negative. After initial fluid resuscitation, he is started on norepinephrine drip for pressor support. Vascular surgery team plans for emergent left below-knee amputation. You are consulted to provide recommendations for diabetes management. What would you recommend?

## Choices:

1. Hold nutritional insulin and continue with basal insulin at home dose
2. Hold nutritional insulin and reduce basal insulin by 20-25%
3. Start an intravenous insulin infusion
4. Reduce both nutritional and basal insulin by 20-25%.

## Answer: 3 - Start an intravenous insulin infusion

## Explanations:

- In critically ill patients, the insulin regimen of choice is intravenous insulin infusion.
- Intravenous insulin has a short half-life of 10-15 minutes, which permits easy titration of insulin dose and helps achieve desired glycemic control.
- In hemodynamically unstable patients, intravenous insulin has more predictable pharmacokinetics as opposed to subcutaneous insulin which may have variable absorption due to dynamic changes, hypoperfusion, etc. and consequently cause unwanted episodes of hyperglycemia and hypoglycemia.
- Due to the unpredictable pharmacokinetics of subcutaneous insulin in this patient with hemodynamic instability, he should be started on intravenous insulin infusion for better glycemic management.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Diabetic Perioperative Management

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## Question 171: A 66-year-old post-menopausal female presents to the clinic with pelvic pain and abnormal vaginal bleeding. An ultrasound demonstrates a 9 cm complex right adnexal mass and heterogenous uterus with a 12 mm endometrial stripe. CA-125 is 42 U/mL, inhibin A and B levels are elevated as well, and endometrial biopsy demonstrates a malignancy. What is the most likely cause of the patient's abnormal vaginal bleeding?

## Choices:

1. Adenomyosis
2. Uterine leiomyoma
3. Endometritis
4. Hormone-secreting ovarian neoplasm

## Answer: 4 - Hormone-secreting ovarian neoplasm

## Explanations:

- Both a 9 cm adnexal mass and 12 mm endometrial stripe are abnormal in a 54-year-old female.
- Elevated inhibin levels in a post-menopausal female are indicative of an adult granulosa cell tumor of the ovary.
- While adenomyosis and leiomyoma can cause abnormal uterine bleeding, it is much more likely that this patient's bleeding is due to estrogen secretion by a granulosa cell tumor of the ovary.
- The endometrial biopsy showed a malignancy, which almost certainly represents an endometrial carcinoma from estrogen stimulation.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Endometrial Cancer

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## Question 172:

A 28-year-old female presents to the hospital with tremors, diaphoresis, and near syncope. Fingerstick glucose shows hypoglycemia. She is given IV dextrose, and her symptoms improve. She undergoes biochemical testing, which is suggestive of endogenous hyperinsulinemia. CT abdomen with contrast done for localization of a suspected tumor is negative. Which of the following is the best next step for diagnosing insulinoma in this patient?

## Choices:

1. Abdominal ultrasound
2. Abdominal MRI
3. Endoscopic ultrasound
4. Selective arterial calcium stimulation test with hepatic venous sampling

## Answer: 3 - Endoscopic ultrasound

## Explanations:

- When there is high suspicion for insulinoma with negative noninvasive studies, invasive tests should be considered.
- Endoscopic ultrasound (EUS) is the best next step for diagnosing insulinoma in this patient.
- EUS has a sensitivity of 70-95% and is superior to CT for localization.
- EUS also enables tissue acquisition that can be very helpful, especially when the tumor is small.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Insulinoma

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## Question 173: A 65-year-old male with well-controlled type 2 diabetes mellitus has a total cholesterol of 220 mg/dL with an LDL of 140 mg/dL. He denies smoking and has no family history of heart disease or stroke. What is the appropriate management?

## Choices:

1. Repeat lipid profile in 6 weeks
2. Add HMG CoA reductase inhibitor
3. Increase fiber intake
4. Initiate cholestyramine therapy

## Answer: 2 - Add HMG CoA reductase inhibitor

## Explanations:

- Diabetes mellitus is considered a coronary heart disease equivalent in risk stratification for lipid management.
- The LDL goal should be less than 70 mg/dL. This goal requires more aggressive intervention than simple dietary changes.
- Adding a statin is indicated. Niacin is relatively contraindicated due to its interference with glucose regulation.
- Statins, also known as HMG-CoA reductase inhibitors, are lipid-lowering medications. Statins reduce cardiovascular disease and mortality in those who are at high risk.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hyperlipidemia

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## Question 174:

A 17-year-old woman presents to her healthcare provider with complaints of nausea, vomiting, and amenorrhoea for 2 months. She usually experiences regular periods in the past, every 29 days, lasting four days with moderate flow. She is sexually active with her partner of 7 months, and they use condoms inconsistently for contraception. She has a history of hyperthyroidism, asthma, and dermatitis. She takes a number of medications but is not compliant with regular follow-ups. Which of the following medications should be discontinued for the patient?

## Choices:

1. Albuterol
2. Propylthiouracil
3. Methimazole
4. Topical betamethasone

## Answer: 3 - Methimazole

## Explanations:

- Amenorrhea in a sexually active young female with inconsistent contraception denotes pregnancy. It is associated with nausea and vomiting depicting morning sickness.
- Of the listed options, methimazole is not used during pregnancy, especially in the first trimester. Propylthiouracil is the preferred anti-thyroid medication during pregnancy.
- Methimazole in pregnant patients is associated with a number of birth defects like aplasia cutis, craniofacial abnormalities such as choanal atresia, gastroesophageal defects, etc. Therefore, this is not recommended for use during pregnancy.
- Patients who intend to get pregnant or are pregnant while on methimazole should inform their healthcare providers immediately so that their anti-thyroid medication can be changed.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Methimazole

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## Question 175:

A young female is seen in the clinic after being diagnosed with subclinical hypothyroidism. The physician orders additional blood work, which reveals the presence of serum anti-thyroid peroxidase antibodies. If left untreated, this patient is most likely going to progress to which of the following?

## Choices:

1. Graves disease
2. Hashimoto's thyroiditis
3. Papillary cancer
4. Thyroid adenoma

## Answer: 2 - Hashimoto's thyroiditis

## Explanations:

- In patients with subclinical hypothyroidism, the risk of progressing to overt hypothyroidism is real.
- When a patient has anti-peroxidase antibody and subclinical hypothyroidism, the progression to a full-blown Hashimoto's disease is very likely.
- Patients without the anti-peroxidase antibody are very unlikely to progress to Hashimoto's thyroiditis.
- With the TSH levels in patients with subclinical hypothyroidism, current recommendations are to start on levothyroxine therapy.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hashimoto Thyroiditis

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## Question 176:

A 54-year-old female patient with a history of poorly controlled diabetes mellitus type 2, hypertension, and obesity presents with complaints of bloating, postprandial fullness, nausea, and vomiting for several days. She denies any recent illness, travel, or use of new medications. On physical examination, vitals are within normal limits, abdominal exam shows slight distention, and no tenderness elicited. Labs show hemoglobin A1c 9%, blood glucose 260 mg/dL, and potassium 3.5 mEq/L. What is next best step in evaluating this patient?

## Choices:

1. Capsule endoscopy
2. Gastric emptying scintigraphy
3. Colonoscopy
4. Urease breath test

## Answer: 2 - Gastric emptying scintigraphy

## Explanations:

- The patient has longstanding poorly controlled diabetes mellitus. She now presents with cardinal symptoms of bloating, postprandial fullness, nausea, and vomiting. The concern is for gastric stasis or gastroparesis.
- The gold standard test for diagnosing gastroparesis is gastric emptying scintigraphy.
- A gastric emptying scintigraphy test result of 4 hours of retention of solids in the stomach confirms the diagnosis.
- It is also important to rule out mechanical obstruction by esophagogastroduodenoscopy (EGD). If an EGD is not possible, barium radiography should be performed.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Gastric Stasis

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## Question 177:

A 65-year-old female presents for evaluation of recurrent fever, and malaise. She states that she went to her healthcare provider one week ago due to fever, malaise, headaches, and cough. She is upset because her healthcare provider told her it was likely a viral infection, and while she felt better three days after she went to the doctor, the fever and malaise are back and Christmas is in two days. Palpation of the thyroid is painful. Thyroid function test reveals a low TSH, and high T3, T4, and thyroglobulin. Which of the following would most likely be seen in histology?

## Choices:

1. Concentric lamellar calcifications
2. Numerous multinucleated giant cells
3. Uniform follicles
4. Undifferentiated giant cells

## Answer: 2 - Numerous multinucleated giant cells

## Explanations:

- Diffuse thyroid tenderness is common with subacute thyroiditis.
- Infection or inflammation, but not malignancy, are suggested by focal tenderness.
- Malignancy tends to present as a hard, possibly fixed, but painless mass.
- Multiple palpable thyroid nodules are most likely benign, commonly due to multinodular goiter or Plummer disease.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### De Quervain Thyroiditis

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## Question 178:

A 15-year-old female is brought to the clinic for evaluation of primary amenorrhea. Her mother states that the patient started pubertal changes at age 11 but did not seem to progress. Her rate of growth has been low normal for age and there has been no menarche. Physical examination shows Tanner stage III breast development and Tanner III-IV pubic hair. There are no dysmorphic features on physical exam. Upon review of systems, the patient states that she has had some headaches. What is the next best step in the management of this patient?

## Choices:

1. Order brain MRI
2. Order blood chromosomes for karyotype
3. Order pituitary function tests including thyroid and prolactin
4. Reassure parent that everything is fine and follow up in six months

## Answer: 3 - Order pituitary function tests including thyroid and prolactin

## Explanations:

- Hormonal testing is the best option as abnormalities of pituitary hormones can delay/prolong puberty. This patient had elevated prolactin from a prolactin-secreting adenoma.
- Elevated prolactin levels can cause delayed puberty, primary amenorrhea, or secondary amenorrhea.
- Pituitary function tests should always be checked first in delayed puberty patients.
- Ordering a brain MRI would be the next step once an abnormality like elevated prolactin is confirmed. If the patient had primary hypothyroidism, a brain MRI would not be indicated. Ordering chromosomes would be indicated if the patient had signs of primary ovarian failure like elevated LH and FSH levels. Once puberty starts, it should progress. Most females have menarche on average 2 years after breast development but can take up to 4 years. This patient is only Tanner stage III for breast development 4 years after pubertal changes started. Follow up in six months would not be appropriate.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Delayed Puberty

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## Question 179: A 55-year-old white male with moderate obesity and medical history of hypertension, hyperlipidemia, and diabetes mellitus presents to his primary care provider’s office with complaints of frequent episodes of fatigue, dizziness, diaphoresis, nausea, palpitations, and shakiness. He is currently taking repaglinide, simvastatin, and irbesartan. An exam in the office is unremarkable. On further questioning, he reveals that he started a new low carbohydrate diet regimen to lose weight. What is the most likely cause of this patient's symptoms?

## Choices:

1. Uncontrolled diabetes mellitus
2. Frequent hypoglycemia
3. Medication noncompliance
4. Panic attacks

## Answer: 2 - Frequent hypoglycemia

## Explanations:

- The symptoms described are typical adrenergic symptoms that are seen in hypoglycemia, not hyperglycemia.
- This patient is most likely on a ketogenic diet which drops blood glucose levels considerably. Patients with diabetes mellitus, especially on pharmacotherapy, need medication adjustment prior to the initiation of a ketogenic diet. This can prevent hypoglycemic episodes, which sometimes can be dangerous.
- This patient appears to be compliant with his medications, which appears to cause his symptoms. However, the only change that he has made is starting a new diet.
- Anxiety disorder is not listed as one of his medical problems. Nevertheless, panic attacks do mimic adrenergic symptoms seen in hypoglycemia. However, this patient has a more likely explanation for his symptoms.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Ketogenic Diet

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## Question 180:

A patient with a history of cirrhosis of the liver presents with shortness of breath in a standing position which gets better in a lying down position. A chest x-ray is negative for pleural effusion. Ultrasound abdomen reveals mild ascites. Which of the following mechanisms is most likely responsible for the patient's symptoms?

## Choices:

1. Impaired metabolism of body hormone
2. Impairment in the urea cycle
3. Increased portal pressure
4. Low serum albumin concentration

## Answer: 1 - Impaired metabolism of body hormone

## Explanations:

- Patients with cirrhosis of the liver are prone to a hyperestrogenic state due to impaired estrogen metabolism.
- It leads to a hyperestrogenic state with the formation of arteriovenous malformation in the lungs, which leads to platypnea and orthodeoxia syndrome.
- Cardiac catheterization is indicated to confirm the diagnosis.
- The impaired urea cycle leads to hyperammonemia which does not cause shortness of breath. Increased portal pressure causes ascites, but the US abdomen reveals mild ascites, which does not explain her symptoms. Low albumin contributes to ascites which is mild in this patient. It is less likely to cause shortness of breath.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Pulmonary Arteriovenous Malformation

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## Question 181:

A 69-year-old female patient with a past medical history significant for hypertension and insulin-requiring diabetes mellitus for the last 15 years associated with diabetic retinopathy, presents to the emergency room for evaluation of her seventh syncopal episode during the previous two months. These episodes have occurred on standing and are associated with dizziness and occasional nausea. She denies any vomiting or diarrhea, and her appetite has been excellent. Her medications include amlodipine 5 mg orally daily, insulin glargine insulin 20 units subcutaneously at bedtime with six units of lispro insulin before meals, lisinopril 20 mg orally daily. She has had a recent cardiac workup including an echocardiogram which showed a normal ejection fraction of 55 percent without any regional wall motion abnormalities. A carotid ultrasound did not show any significant stenosis. On examination, she appears well. Supine blood pressure is 188/94 mmHg with a heart rate of 72 beats/minute but on standing blood pressure is 152/80 mmHg with a heart rate of 79 beats per minute. Physical examination is essentially normal except for multiple bruises on the skin from recent falls. EKG is normal as is laboratory data except for blood glucose of 152 and serum creatinine of 1.3 mg/dL and hemoglobin A1c of 6.7%. What is the most likely etiologic cause of recurrent syncope in this patient?

## Choices:

1. Cardiogenic
2. Vasovagal
3. Neurogenic orthostatic hypotension
4. Seizures

## Answer: 3 - Neurogenic orthostatic hypotension

## Explanations:

- Long-standing diabetes mellitus is one of the multiple causes of autonomic dysfunction which could lead to neurogenic orthostatic hypotension.
- The autonomic nervous system comprises the sympathetic and parasympathetic nervous system, which work in balance to regulate various body processes.
- Inadequate engagement of the autonomic nervous system in response to a decrease in blood pressure results in persistent hypotension.
- Orthostatic hypotension can be treated with a combination of both pharmacological and nonpharmacological therapy, for example, midodrine, waist-high compression stockings.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Orthostatic Syncope

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## Question 182: A 57-year-old female patient with a history of poorly controlled diabetes mellitus type 2, hypertension, and obesity presents with complaints of bloating, postprandial fullness, nausea, and vomiting for several days. She had a recent esophagogastroduodenoscopy with no acute abnormalities and was diagnosed with gastroparesis based on a gastric emptying study. What is the next best step in management?

## Choices:

1. Erythromycin
2. Tramadol
3. Dietary modifications and glycemic control
4. Exenatide

## Answer: 3 - Dietary modifications and glycemic control

## Explanations:

- After the diagnosis of gastroparesis and ruling out other causes of her symptoms, the most important step in management is restoring her nutrition and glycemic control.
- Restoration of nutrition includes small, frequent meals and a low fat and low fiber diet.
- In patients with diabetes mellitus, optimizing glycemic control is a vital step along with dietary modifications.
- Certain antidiabetic medications, such as the GLP-1 analog exenatide, worsen delayed gastric emptying and should be avoided in patients with diabetic gastroparesis.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Gastric Stasis

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## Question 183:

A 55-year-old lady presented with a diffuse, painful rash of 6 months duration present over her extremities, around her mouth and genitalia. Further questioning revealed she had lost 20 pounds (9 kg) over the past six months. She has on and off diarrhea for about a year. On exam, she was noted to have diffuse ulcerated plaque-like weeping rash present on multiple areas of her body. Blood work showed fasting blood glucose of 142 mg/dl (normal 65-99) and hemoglobin 10.1 g/dl (normal 11.5-15.3). Which of the following blood test should be drawn next to confirm the suspected diagnosis?

## Choices:

1. Serum glucagon levels
2. Serum celiac disease panel
3. Serum vasoactive intestestinal peptide (VIP) levels
4. Serums gastrin levels

## Answer: 1 - Serum glucagon levels

## Explanations:

- The history, physical examination, and laboratory studies suggest she has glucagonoma syndrome.
- It presents as a rash known as necrolytic migratory erythema which typically involves perioral, perigenital, and the extremities
- Patients frequently have mild diabetes mellitus and normocytic anemia.
- Weight loss is present in up to 90% of patients.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Glucagonoma Syndrome

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## Question 184:

A 34-year-old male presents to his primary care provider complaining of bone pain and hearing loss. The patient states he feels as though his ears are plugged, and he cannot hear as well as he did 6-months ago. Lab values reveal an increased serum alkaline phosphatase, normal calcium, normal parathyroid hormone, and normal CBC. An x-ray reveals a mosaic pattern of woven and lamellar bone. What is the mechanism of action of the first line of therapy for this patient's diagnosis?

## Choices:

1. Increased osteoblast activity
2. Increased parathyroid hormone release
3. Monoclonal antibody-mediated RANKL inhibition
4. Inhibition of osteoclast-mediated bone reabsorption

## Answer: 4 - Inhibition of osteoclast-mediated bone reabsorption

## Explanations:

- First-line therapy for Paget disease of the bone is bisphosphonates, specifically alendronate.
- Alendronate should be taken in the morning on an empty stomach.
- Hypocalcemia is a common adverse effect of alendronate therapy, and calcium levels should be monitored.
- Alendronate inhibits osteoclast-mediated bone reabsorption.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Alendronate

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## Question 185:

A 35-year-old female presented with a complaint of flushing, severe headaches, and palpitation when she gets excited. Initially, her blood pressure was 125/85 mmHg. However, when the left upper quadrant of the abdomen was palpated, deep sympathetic signs were noted, and her blood pressure rose to 200/140 mmHg. A mass in the left quadrant was also reported on her CT scan. Which of the following nerves innervate the affected structure?

## Choices:

1. Postsynaptic parasympathetic nerves
2. Preganglionic sympathetic nerves
3. Lesser and least splanchnic nerves
4. Postganglionic sympathetic nerves

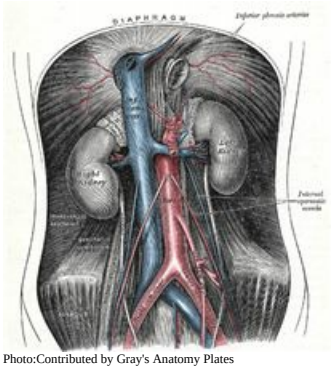

Photo:Contributed by Gray's Anatomy Plates

## Answer: 2 - Preganglionic sympathetic nerves

## Explanations:

- This patient most likely has a tumor of the left adrenal gland, most likely the adrenal medulla, which is responsible for all the sympathetic symptoms. A CT scan is done to confirm the diagnosis.
- The adrenal medulla is innervated by preganglionic sympathetic fibers which arise from the thoracic levels of the spinal cord, usually T10 - L1.
- The adrenal medulla is the inner part of the adrenal glands, and it produces acute stress hormones, epinephrine and norepinephrine, which are primarily responsible for the body's flight and fight response.
- These hormones raise the heart rate and force of cardiac contractions, increasing blood flow to the muscles and the brain, as well as relaxing the airway smooth muscles. They also increase blood pressure by vasoconstriction of the peripheral blood vessels.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Anatomy, Abdomen and Pelvis, Adrenal Glands (Suprarenal Glands)

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## Question 186: A 35-year-old postpartum female presents with a progressive headache. On physical exam, there are no cranial nerve deficits. Her gadolinium-enhanced MRI of the brain is shown. Which of the following is the most appropriate therapy?

## Choices:

1. Observation
2. Non-steroidal anti-inflammatory medication
3. Glucocorticoid therapy
4. Surgical resection

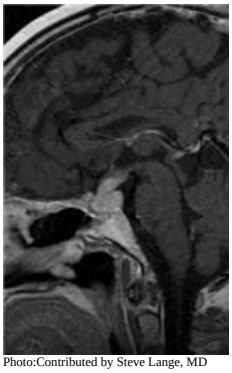

Photo:Contributed by Steve Lange, MD

## Answer: 3 - Glucocorticoid therapy

## Explanations:

- Lymphocytic hypophysitis is a rare autoimmune disease of the pituitary gland classically seen in peripartum women with headache or middle-aged men with diapedes insipidus.
- Lymphocytic hypophysitis may present with pituitary dysfunction, such as central diabetes insipidus, anterior pituitary hormone deficiency, and hypo/hyperprolactinemia. The degree of lymphocytic infiltration corresponds to the degree of pituitary enlargement, which may secondarily cause mass effect and contribute to visual loss, ophthalmoplegia, and headache.
- Lymphocytic hypophysitis is a diagnosis of exclusion, and histopathology with tissue biopsy is needed for a definitive diagnosis. Clinical information, laboratory data, and imaging, however, can help with the diagnosis. Gadolinium-enhanced MRI of the pituitary is the modality of choice, and may demonstrate an avidly-enhancing, thickened pituitary stalk, enlarged pituitary gland, and loss of the normal posterior pituitary "bright spot". Gutenberg scoring was developed to correctly distinguish lymphocytic hypophysitis from pituitary adenoma.
- The main goal of treatment of lymphocytic hypophysitis is to manage pituitary hormone deficiencies and mass effect. Treatment consists of conservative management and anti-inflammatory medication. Surgery is employed for patients suffering from visual problems, compression of nearby structures, or equivocal imagining findings that require histology for diagnosis.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Lymphocytic Hypophysitis

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## Question 187: A 65-year-old male with hypertension presents to the family practice clinic with a complaint of double vision, which started one week ago. The patient's double vision is eliminated when covering either eye. The clinician suspects a cranial nerve palsy is the cause. The clinician gets basic lab work and finds that the patient has a hemoglobin A1C of 12.3. What is the most common extraocular movement deficit due to a cranial nerve palsy caused by the patient's new diagnosis?

## Choices:

1. Supraduction
2. Infraduction
3. Abduction
4. Adduction

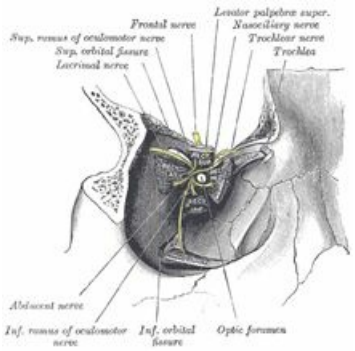

Photo:Contributed by Gray's Anatomy Plates

## Answer: 3 - Abduction

## Explanations:

- A hemoglobin A1C of 12.3 is diagnostic for diabetes mellitus. The microvascular disease from diabetes mellitus can cause cranial nerve abnormalities. The most commonly affected cranial nerve is the abducens, followed by the oculomotor, and then the trochlear.
- The abducens nerve controls abduction of the eye.
- Damage from diabetes mellitus is most likely secondary to focal vascular injury along the nerve with subsequent demyelination.
- Complete or near complete recovery often occurs in days to months.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Abducens Nerve Palsy

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## Question 188:

An 82-year-old female presents to the emergency department after falling in her home. She was getting dressed when she lost balance and fell on her left side. Her blood pressure is 138/70 mmHg, heart rate is 80/min, respiratory rate is 16/min, and body mass index (BMI) is 31 kg/m^2. Past medical history is significant for hypothyroidism. She admits that she had one glass of wine before her fall and that she usually has one glass every other night. The physical exam reveals a shortened and externally rotated left leg. Which of the following is the major risk factor for femoral fracture in this patient?

## Choices:

1. Obesity
2. Alcohol use
3. Hypothyroidism
4. Age

Photo:Contributed by Scott Dulebohn, MD

## Answer: 4 - Age

## Explanations:

- This patient's age and sex are two important risk factors for osteoporosis. Elderly female patients are at high risk for osteoporosis secondary to decreased estrogen levels. Osteoporosis increases the risk of femoral fracture secondary to a ground-level fall. While alcohol use is also an important risk factor, her use of 3 to 4 glasses per week is not a significant contributory factor. Patients who drink greater than 14 alcoholic beverages per week are at increased risk of developing osteoporosis.
- Femoral neck fractures are evaluated by plain film x-ray and can be classified using the Garden classification. Garden I is an incomplete femoral neck fracture that is minimally displaced or valgus impacted. Garden II is a complete fracture with minimal displacement. Garden III is a complete fracture with less than 50% displacement. Garden IV is a complete fracture with more than 50% displacement.
- Displaced femoral neck fractures are often complicated by avascular necrosis and non-union, especially in elderly patients.
- Treatment of displaced femoral neck fractures is typical with open reduction and internal fixation. However, in elderly patients, hemiarthroplasty or total arthroplasty may be indicated.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Anatomy, Bony Pelvis and Lower Limb, Femur

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## Question 189:

A 32-year-old male patient who is a software engineer is brought in with an episode of confusion and lethargy to the emergency department by his concerned wife. The patient is on the bed with his eyes closed and speaking in a low voice. He is alert and oriented but only speaking in small sentences and appeared drowsy. The wife notes that similar episodes with dizziness and confusion have been happening but have become frequent in the last one month. He is trying to lead a healthy lifestyle, eat an organic diet as much as possible, occasionally drinks a couple of beers over the weekend, and is a nonsmoker. The patient weighs 98 kg with a body mass index of 30. He has attended a lifestyle program around 2 months ago to lose some weight and be more healthy. On further inquiry, the patient had a fall when he hit his head a week ago but was fine after that. CT scan of the head was done and showed no acute abnormality. Labs revealed a serum glucose level of 118 mg/dl, a serum sodium level of 136, and urinalysis showed a urine osmolality of 300 mOsm/l. The nurse notices that the patient urinated several times during his stay in the emergency department. The patient was also carrying a big bottle of water along with him to keep himself well hydrated. He is observed in the hospital for further workup and treatment. He is found to have urinated 5.5 L/24hrs in the input/output section of the chart the next day. What is the next step in the diagnosis?

## Choices:

1. Diagnose the patient with primary polydipsia
2. Administer desmopressin and check urine osmolality
3. Do a water deprivation test
4. Diagnose him with central diabetes insipidus

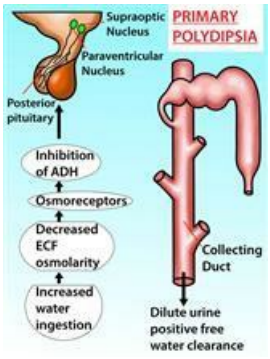

Photo:Contributed by Scott Dulebohn, MD

## Answer: 3 - Do a water deprivation test

## Explanations:

- This patient cannot be diagnosed with primary polydipsia because his sodium level is 136 mEq/L. In a hypotonic polyuric patient, a low plasma sodium concentration at presentation less than 135 mEq/L is indicative of primary polydipsia. But in this case, the serum sodium level is 136 mEq/L. The patient has polyuria evidence by urine volume > 50 ml/kg/24 hrs, but this can be primary polydipsia or diabetes insipidus.
- The administration of desmopressin only comes into picture after the water deprivation test is done to challenge the vasopressin secretion. If the water deprivation test shows that the urine osmolality increases to > 800 mOsm, it is enough to diagnose primary polydipsia.
- The next step would be to do a water deprivation test since the sodium level is between 136 and 146 mEq/L to help differentiate polyuric conditions.
- After hypotonic polyuria is established, and if the serum sodium level is > 147 mEq/L, it is diagnostic of diabetes insipidus but not when serum sodium is between 136 and 146 mEq/L as in this case.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Primary Polydipsia

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## Question 190:

A 29-year-old man is being evaluated in the hospital after acute myocardial infarction. On examination, he is noted to have multiple xanthomas in the ankles and elbows. Lab studies showed an elevated troponin and an LDL cholesterol level of 250 mg/dL. Which of the following is most often associated with the patient's underlying disease?

## Choices:

1. Mitral stenosis
2. Mitral valve prolapse
3. Aortic stenosis
4. Aortic regurgitation

## Answer: 3 - Aortic stenosis

## Explanations:

- Familial hypercholesterolemia (FH) is a common genetic disorder predisposing to premature atherosclerotic cardiovascular disease.
- Patients with familial hypercholesterolemia develop early-onset atherosclerotic cardiovascular disease.
- In some patients, atherosclerosis can involve the aortic valve resulting in stenosis at an early age.
- Patients with familial hypercholesterolemia usually present with xanthomas and xanthelasma, which are usually a clue to the diagnosis.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Familial Hypercholesterolemia

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## Question 191:

A 40-year-old woman presents to the clinic with complaints of painful intercourse since last year. She has been bumping into corners of her home recently. Her last menstrual period was forty days ago. A vaginal speculum examination shows a dry vagina. Ultrasound of abdomen and pelvis shows no abnormalities. Which of the following therapies is most likely to improve the patient's condition?

## Choices:

1. Escitalopram
2. Bromocriptine
3. Cetirizine
4. Vaginal dilators

## Answer: 2 - Bromocriptine

## Explanations:

- This patient presents with complaints of painful intercourse that is caused by a dry vagina, as indicated by a vaginal speculum examination. Her last menstrual period was forty days ago, which shows she has developed oligomenorrhea also. These two complaints, along with her history of bumping into corners of the home, reveal a diagnosis of prolactinoma.
- A prolactinoma is a benign tumor of the pituitary gland that produces a hormone called prolactin. It is associated with signs of estrogen deficiency like a dry vagina, osteoporosis, and oligomenorrhea. Prolactinoma can compress optic chiasm resulting in bitemporal hemianopia. MRI of the pituitary gland is used to diagnose a prolactinoma.
- Dopamine agonists like bromocriptine and cabergoline are used to block excessive production of prolactin.
- Vaginal dilators are of no use in treating vaginal dryness when it is caused by a prolactinoma. They are used to dilate a small vagina when it causes difficulties during sexual intercourse.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Oligomenorrhea

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## Question 192:

A 42-year-old male presents to the physician with complaints of abdominal pain and difficulty in passing bowel movements for the past couple of weeks. He also adds that he feels weak and gets tired easily. Physical examination reveals a tired-looking male with no other contributory findings. Further laboratory evaluation reveals a hemoglobin of 14 g/dL, serum calcium of 11 mg/dL, elevated parathyroid hormone, and a urinary calcium level of less than 100 mg in 24 hours. What is the most likely diagnosis in this patient?

## Choices:

1. Familial hypocalcemic hypercalciuria
2. Hypothyroidism
3. Primary hyperparathyroidism
4. Lymphoma

## Answer: 1 - Familial hypocalcemic hypercalciuria

## Explanations:

- Hyperparathyroidism and malignancy are the most common causes of hypercalcemia.
- Granulomatous disorders like sarcoidosis can also cause hypercalcemia.
- Drugs that can cause hypercalcemia include thiazides, lithium, milk-alkali syndrome, and theophylline toxicity.
- Rare causes include immobilization, AIDS, hypophosphatasia, and advanced liver disease.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hypercalcemia

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## Question 193: A 45-year-old female patient admitted with diabetic ketoacidosis was referred to the ophthalmology department with the complaint of right eye periorbital swelling, pain, and decreasing vision since 1-day. She was a poorly controlled diabetic with an HbA1C level of 65 mmol/mol. On clinical evaluation, reduced visual acuity of 20/200, relative afferent pupillary defect, increased intraocular pressure, and restriction of ocular movements were noted in the right eye. Orbital CT scan was suggestive of right side proptosis and opacification of the right paranasal sinus. What is the likely etiology for this scenario?

## Choices:

1. Mucormycosis
2. Staphylococcus aureus
3. Haemophilus influenzae
4. Fusobacterium

## Answer: 1 - Mucormycosis

## Explanations:

- Diabetic ketoacidosis patients are more prone to fungal infections like mucormycosis, initially involving the paranasal sinuses, which spreads to orbit, leading to orbital cellulitis. One should suspect a fungal etiology in diabetic patients presenting with features of orbital cellulitis.
- Other risk factors for fungal orbital cellulitis include immunocompromised state secondary to malignancy, HIV, and post-transplant patients on immunosuppressants like corticosteroids and antimetabolites.
- Fungal orbital cellulitis can be diagnosed based on biopsy and microbiological investigations. Also, early management with intravenous antifungals and orbital exenteration may be needed due to the aggressive nature of the disease.
- Intravenous lipid-soluble amphotericin B remains the mainstay of medical treatment in the management of fungal orbital cellulitis.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Ocular Cellulitis

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## Question 194:

A 40-year-old woman presents with a three-week history of episodic anxiety, diaphoresis, headaches, and tremors. Her past medical history includes recently diagnosed hypertension. A 24-hour urinary metanephrines test is found to be elevated. A CT scan shows bilateral adrenal masses, and the decision to proceed with the most appropriate surgical procedure is made. Which of the following parameters should be most closely monitored to prevent the major complication of this surgery?

## Choices:

1. Blood glucose
2. Electrolytes
3. Vital signs
4. Infection

## Answer: 3 - Vital signs

## Explanations:

- This patient likely has bilateral pheochromocytomas, producing catecholamines that result in clinical symptoms such as episodic diaphoresis, palpitations, and headaches. Treatment for bilateral pheochromocytomas is usually with bilateral adrenalectomy.
- Primary adrenal insufficiency occurs after bilateral adrenalectomy. Adrenal crisis is a major complication status post adrenalectomy.
- Signs and symptoms of adrenal crisis are volume depletion, hypotension, hyponatremia, hyperkalemia, fever, abdominal pain. Tachycardia and hypotension are initial presenting signs of vascular collapse. As such, vital signs must be monitored closely.
- Patients typically respond well to parenteral hydrocortisone administration. Infections are the major precipitating causes of adrenal crisis. Glucose and electrolytes should be monitored but not as intensively as blood pressure and heart rate.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Adrenalectomy

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## Question 195:

A 48-year-old Hispanic man presents to the emergency department complaining of abdominal pain, nausea, weight loss, and yellowing of skin for 2 weeks. He has a past medical history of diabetes mellitus, hyperlipidemia, and hypertension. His social history is significant for alcohol use disorder. His medications include simvastatin 20 mg daily, metformin 1000 mg twice daily, and amlodipine 5 mg daily. On physical examination, vital signs show blood pressure 140/80 mmHg, pulse 100/min, and temperature 98 F. The patient's lipid panel is shown below.

| | Patient value | Reference range |
|---|---|---|
| Total cholesterol | 1000 mg/dL | 200 mg/dL |
| LDL cholesterol | 400 mg/dL | 100 mg/dL |
| HDL cholesterol | 25 mg/dL | 45-90 mg/dL |
| Triglycerides | 200 mg/dL | 70-150 mg/dL |

Which of the following is the most likely cause of the patient's lab abnormalities?

## Choices:

1. Lipoprotein X induced hypercholesterolemia
2. Familial hypercholesterolemia
3. Metabolic syndrome
4. LCAT deficiency

## Answer: 1 - Lipoprotein X induced hypercholesterolemia

## Explanations:

- Lipoprotein X is formed in patients with liver dysfunction. This patient has a history of alcohol use disorder, which could lead to cirrhosis and therefore cause liver dysfunction affecting bile absorption and synthesis.
- Lipoprotein X has the same density as LDL, so it causes false elevation of LDL.
- Lipoprotein X contains a high percentage of phospholipid and unesterified esters and a small amount of proteins.
- lipoprotein X does not have Apo b-100 like other lipoproteins.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Lipoprotein X Induced Hyperlipidemia

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## Question 196: A 45-year-old woman presents to the clinic to establish care. She has a BMI of 38 kg/m$^2$ and has tried multiple diets and exercise regimens to help lose weight. Her vital signs show a blood pressure of 150/100 mmHg, a temperature of 98.7 F, and she is saturating at 97% on room air. Labwork in this visit also reveals an HbA1c of 9.2%. Which of the following is the best initial therapy for this patient?

## Choices:

1. Semaglutide once-weekly
2. Exenatide once-weekly
3. High-dose liraglutide once-daily
4. Lixisenatide once-daily

## Answer: 3 - High-dose liraglutide once-daily

## Explanations:

- High-dose liraglutide has been FDA approved for chronic weight management in adults with BMI >30 and with one or more weight-related conditions (obstructive sleep apnea, diabetes mellitus, hypertension, etc.).
- Semaglutide once weekly is only approved for the treatment of type 2 diabetes mellitus to reduce HbA1c. However, the high-dose formulation of semaglutide has recently been approved by the FDA in 2021 for the treatment of obesity.
- Exenatide is not FDA-approved for the treatment of obesity.
- Lixisenatide is only approved for achieving glycemic control in type 2 diabetes mellitus.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Compare And Contrast the Glucagon-like Peptide-1 Receptor Agonists (GLP1RAs)

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## Question 197:

A 27-year-old woman with a history of hypothyroidism on levothyroxine presents to the emergency department due to sustaining a fall at home. She had stood up from her bed in the morning and experienced a syncopal episode as described by her husband. He states that the patient has recently lost 10 pounds (4.5 kg) and had several days of diarrhea that was symptomatically controlled with over-the-counter medications. Physical exam reveals a blood pressure of 92/74 mmHg and a heart rate of 124/min. All other vital signs are within normal limits. The patient has sunken eyes and diffuse bronze discoloration of her skin. Blood is drawn, and laboratory testing reveals sodium 128 mmol/L, potassium, 5.2 mmol/L, chloride 104 mmol/L, bicarbonate 33 mmol/L, creatinine 1.1 mg/dL, and BUN 15 mg/dL. The patient is admitted for further evaluation and fluid resuscitation. Which of the following changes is most likely to be seen if this patient underwent a sleep study?

## Choices:

1. Increased REM and decreased NREM
2. Increased REM and increased NREM
3. Decreased REM and decreased NREM
4. Decreased REM and increased NREM

## Answer: 4 - Decreased REM and increased NREM

## Explanations:

- Cortisol and other steroid hormones analogs appear to play a role in the regulation of sleep, and multiple studies have shown an association between aberrations in plasma cortisol and sleep architecture.
- Addison disease patients experience more NREM sleep and less REM sleep, which is corrected with corticoid replacement therapy.
- Patients with excess cortisol in conditions such as Cushing syndrome display less NREM sleep and more awakening associated with excess cortisol secretion.
- Restoring basal levels of cortisol in such conditions restores normal sleep architecture.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### REM Rebound Effect

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## Question 198:

A 26-year-old woman is seven months pregnant. She visits her primary care provider complaining of recurring headaches, tunnel vision, and sensitivity to light. A head CT reveals a pituitary adenoma, and the patient's lab work is significant for elevated prolactin. The provider recommends treatment with a dopamine agonist. Which of the following best describes the anticipated hormonal disruption before and after treatment?

## Choices:

1. Pathologic decrease in human chorionic gonadotropin (hCG) regardless of treatment
2. Relatively stable hCG regardless of treatment
3. Pathologic decrease in hCG restored to normal levels after treatment
4. Relatively stable hCG that becomes pathologically decreased after treatment

## Answer: 2 - Relatively stable hCG regardless of treatment

## Explanations:

- Although some human chorionic gonadotropin (hCG) is produced by gonadotrophs of the anterior pituitary, the primary source of hCG during pregnancy is the placenta. The ability of the anterior pituitary to produce hCG during pregnancy should not significantly impact overall maternal hCG levels.
- Bromocriptine is the dopamine receptor agonist of choice for prolactinomas during pregnancy. Neither elevated prolactin nor bromocriptine therapy has been shown to affect fetoplacental endocrine function.
- HCG levels typically plateau during the third trimester. HCG secretion is directly correlated with trophoblastic tissue mass (as measured by trophoblast tissue width or placental weight, depending on the gestational age). Therefore, low hCG may indicate placental dysfunction or atrophy.
- The intrauterine conditions are dependent upon placental function as the placenta is the primary source of fetal nourishment. Suboptimal conditions due to an atrophic placenta may contribute to the risk of fetal growth restriction.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Prolactinoma

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## Question 199:

A 43-year-old woman presents to the clinician with complaints of low energy, cold intolerance, and constipation. She further adds that she has gained 10 lb (4.5 kg) in a short period. The provider suspects that she has hypothyroidism. Further laboratory workup revealed a T4 of 0.3 ng/dL (normal range 0.4 to 1.7 nanograms per deciliter) and a TSH (thyroid-stimulating hormone) of 12 mU/L (normal range 0.4 to 4.0 milli-international units per liter). The patient starts receiving hormone replacement therapy in the form of Levothyroxine 100 mcg/day. Which of the following hormones is measured to adjust the dosage of Levothyroxine?

## Choices:

1. Free T4 levels
2. Free T3 Levels
3. Thyroid-stimulating hormone (TSH)
4. Total T3 levels

## Answer: 3 - Thyroid-stimulating hormone (TSH)

## Explanations:

- TSH is used to adjust the dosage because TSH secretion is sensitive to feedback inhibition by thyroid hormones. Particularly in primary hypothyroidism, TSH is the first laboratory test to be ordered.
- As the levels of thyroid hormones normalize, it will improve the levels of TSH to the normal range and increase the free T4 levels to the target range.
- Free T4 is helpful in secondary hypothyroidism; however, in primary it does add additional information. However, TSH is the best test to titrate the Levothyroxine dose.
- Free T3 levels are not accurate. Total T3 does not help in the management of primary hypothyroidism

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hypothyroidism

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## Question 200:

A 40-year-old male was found in a semi-comatose condition and brought to the emergency department. On physical examination, his blood pressure was 80/40 mmHg; his pulse rate was 50 beats/min with temperature 32°C. He was disoriented and lethargic. There was no palpable thyroid enlargement, but a scar was seen in his neck. Laboratory test results demonstrate: hemoglobin 10 g/dl; WBC count 5000 cells/mm3; platelet count 257,000 cells/mm3; creatinine 1.5 mg/dl sodium 129 meq/l; potassium 3.8 mEq/L; chloride 93 mEq/L; and bicarbonate 24.5 mEq/L. Chest radiography and CT brain didn't reveal any abnormalities. Blood and urine cultures were sent.EKG showed sinus bradycardia with a prolonged QT interval. The patient was started on intravenous fluid resuscitation with broad-spectrum antibiotics. Which of the following is true regarding this patient clinical condition?

## Choices:

1. This condition is more common in male than female
2. Rapid rewarming is essential for patient survival
3. Cardiomegaly with pericardial effusion can be found on examination
4. This condition is more common in summer than in winter

## Answer: 3 - Cardiomegaly with pericardial effusion can be found on examination

## Explanations:

- The patient has myxedema coma given the history of hypotension, bradycardia, hyponatremia, and anemia. The scar in his neck indicates a prior thyroidectomy. Cardiomegaly and pericardial effusion can be found on examination. This condition is more common in winter and females. Slow rewarming is essential for survival.
- Low voltage on EKG can be representative of pericardial effusion due to the accumulation of fluid rich in mucopolysaccharides.
- Myxedema causes decreased myocardial contractility and reduced cardiac output, which leads to hypotension and leads to cardiomegaly with heart failure.
- Myocardial infarction is essential to rule out prior to starting T4 replacement as aggressive T4 replacement may increase the risk of myocardial infarction.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Myxedema

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## Section 3

Question 201: A 35-year-old female presents to the infertility clinic due to an inability to conceive. She has frequent and unprotected intercourse with her husband for the last 8 months. The husband has two sons from a previous marriage. Her medical history is significant for hypertension, diabetes, and vitiligo. Recently, she has experienced weight gain and an irregular menstrual cycle. Labs show: FSH 20 mIU/mL, Prolactin 150 ng/mL, and TSH 12 µU/mL. Which of the following hormones is most likely involved in the pathophysiology of this patient's infertility?

### Choices:

1. Follicle-stimulating hormone
2. Vasopressin
3. Thyrotropin-releasing hormone
4. Oxytocin

## Answer: 3 - Thyrotropin-releasing hormone

## Explanations:

- While dopamine (a prolactin release-inhibiting hormone) has the most dominant influence on prolactin secretion by inhibiting its secretion, the thyroid-releasing hormone stimulates prolactin secretion. Prolactin, in turn, causes amenorrhea.
- This patient presents with primary hypothyroidism, as evidenced by her labs (elevated TSH and prolactin) and symptoms of hypothyroidism. TRH is elevated in primary hypothyroidism due to a lack of negative feedback inhibition from the low T3 and T4.
- This patient primary hypothyroidism could be due to Hashimoto's thyroiditis, which is associated with other autoimmune disorders such as vitiligo.
- Follicle-stimulating hormone (FSH) is not the cause of this patient's infertility. However, other conditions are associated with infertility, and FSH could be elevated, such as primary ovarian failure or low as in Sheehan's syndrome. Oxytocin and vasopressin are secreted from the posterior pituitary while prolactin is secreted from the anterior pituitary.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hyperprolactinemia

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## Question 202:

A 50-year-old woman presents to the hospital with a lump on her throat that has gradually increased in size over the past four months. She does not have problems swallowing, dyspnea, or changes in voice. Examination shows a 3.5-cm, hard swelling on the left side of her neck that moves with swallowing. There is no cervical or axillary lymphadenopathy. The remainder of the examination shows no abnormalities. Her vitals are normal. Thyroid function tests are within the reference range. Ultrasound of the neck shows an irregular, hypoechogenic mass in the left lobe of the thyroid. A fine-needle aspiration biopsy is inconclusive. The surgeon proceeds with diagnostic lobectomy and isthmectomy, as it is the next best step in the diagnosis. Surgery shows a 3.5-cm thyroid tumor with invasion of surrounding blood vessels. The specimen is sent for histopathological examination. Which of the following is most likely to be seen on microscopic examination of the mass?

## Choices:

1. Capsular invasion
2. Undifferentiated giant cells
3. Psammoma bodies and orphan Annie nuclei
4. Infiltration of lymphoid tissue

## Answer: 1 - Capsular invasion

## Explanations:

- The patient has follicular thyroid carcinoma (FTC) of the thyroid. The invasion of surrounding vascular structures by the tumor suggests follicular carcinoma. Diagnosis of FTC is dependent on abnormal positioning and spread of thyroid follicles, including extracapsular and vascular invasions. Nuclear atypia itself may or may not be present, although it does indicate a worse prognosis when present. Given that individual cellular morphology is insufficient for FTC diagnosis, a fine-needle aspiration (FNA) biopsy cannot be used to diagnose FTC fully.
- Capsular and blood vessel invasion are characteristic findings of follicular thyroid cancer, the second most common type of thyroid cancer after papillary thyroid cancer. This type of tumor typically presents without lymph node involvement.
- Further treatment will likely involve total thyroidectomy with neck dissection, possibly followed by radioiodine therapy. Afterward, thyroid hormone replacement therapy (i.e., levothyroxine) is initiated.
- Infiltration is seen in thyroid lymphoma. Orphan Annie nuclei and psammoma bodies are seen in papillary thyroid carcinoma. Undifferentiated giant cells are characteristic of anaplastic carcinoma.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Thyroid Cancer

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## Question 203:

A 38-year-old woman presents to the clinic with complaints of headache and blurry vision. She has a history of hypertension and hypokalemia. She takes antihypertensive medications and potassium supplements. The vital signs reveal a blood pressure of 196/112 mmHg. The rest of the physical exam is unremarkable. Laboratory values reveal serum sodium of 141 mmol/L, potassium of 3.3 mmol/L, bicarbonate of 26 mmol/L, chloride of 104 mmol/L, creatinine of 0.9 mg/dL, serum cortisol of 12 mcg/dL, serum aldosterone of 16 ng/dL, and aldosterone to renin ratio of 38. Serum potassium is corrected. 40 mg furosemide is given intravenously, and two hours later, plasma renin activity is measured to be 1.4 ng/mL/h. What is the next best step in the management of this patient?

## Choices:

1. Perform saline infusion test
2. Re-check aldosterone and aldosterone renin ratio
3. Adrenal computed tomography scan
4. Adrenal vein sampling

## Answer: 3 - Adrenal computed tomography scan

## Explanations:

- Based on the symptoms of poorly controlled hypertension and hypokalemia, this patient is suspected of having hyperaldosteronism.
- Aldosterone level is more than 12 ng/dL, and aldosterone renin ratio is more than 30, so the patient screens positive for primary hyperaldosteronism.
- The patient had a positive furosemide test. Plasma renin activity is less than 2 ng/mL/h after two hours. This confirms the diagnosis of primary hyperaldosteronism. So the next step would be adrenal imaging.
- A saline infusion test is not needed as the patient had a confirmatory furosemide test. Rechecking aldosterone levels or aldosterone-renin ratio is not required in this patient as the patient has already screened positive. Adrenal vein sampling is not needed at this stage before adrenal imaging.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hyperaldosteronism

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## Question 204:

A 25-year-old man presents to the clinic for follow up. He has a history of having sex with other males since age 14. In recent testing, his HIV results were positive and he was put on antiretroviral therapy (ritonavir/atazanavir/tenofovir). His BMI is 20 kg/m2 and he has no first degree relatives with diabetes. He is a bodybuilder and has an active lifestyle. His blood pressure is 118/70 mmHg. His complete metabolic panel 2 years ago demonstrated a normal fasting blood sugar. What is the most appropriate frequency to screen for diabetes in this patient?

## Choices:

1. Every 3 years beginning at age 45
2. Biannually
3. If he demonstrates symptoms of hyperglycemia
4. Annually

## Answer: 4 - Annually

## Explanations:

- According to the ADA 2016 guidelines for the diagnosis and management of diabetes in HIV infected people, fasting blood sugar should be obtained prior to beginning antiretroviral therapy.
- Screening for diabetes should take place 3 months after the beginning of antiretroviral therapy or a change in highly active antiretroviral therapy (HAART).
- After the initiation of antiretroviral therapy and the first 3-month screen for diabetes, annual screening should be initiated.
- Fasting blood sugar is the test recommended to test for diabetes in those infected with HIV because HgbA1c may be affected by a higher rate of turnover of red blood cells, which is thought to result from nucleoside/nucleotide reverse transcriptase inhibitors (NRTIs).

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Diabetes Mellitus Screening

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 205: A 65-year-old man presents with a six-month history of fatigue and depressed mood. He reports erectile dysfunction for the last four months and decreased libido. The patient also says he has hot flushes, which started three weeks ago. He has a past medical history of hypertension and gastroesophageal reflux disease (GERD). A blood test shows hgb of 11.5 g/dL with an MCV of 90 fL. Given the most likely diagnosis, what is the most appropriate administration route for supplemental treatment to best maintain consistent therapeutic levels?

## Choices:

1. Lotion
2. Gel
3. Patch
4. Oral tablets

## Answer: 2 - Gel

## Explanations:

- Testosterone gel has fewer side effects and offers more consistent levels of testosterone than the patch or lotion. Oral forms are generally discouraged due to absorption problems, rapid metabolism, and possible liver toxicity issues. However, an oral testosterone undecanoate is now FDA approved for use in the US. This would not be appropriate in a man with stomach issues. Intramuscular forms for intramuscular injections are reasonable, reliable, and relatively inexpensive, but not subcutaneous.
- The primary caution is for patients using a gel is to avoid exposing family members to the medication by observing good handwashing and avoiding skin contact after applying the medication, especially children and women. If a child or woman makes contact with the application area, the exposed area should be washed with soap and water.
- Subcutaneous testosterone is preferred to intramuscular. When using injections, the typical interval is one week. Longer periods are possible, but they risk causing supernormal levels at the peak, which is usually 2 days after the injection. An alternative is to check testosterone levels mid-week for a median value. Periodic PSA checks and CBC's are recommended.
- Side effects include trouble sleeping, nausea, vomiting, headache, dizziness, hair loss, changes in sexual desire, and skin changes, including redness, swelling, color differences, and acne.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Androgen Replacement

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 206:

A 39-year-old female comes to the clinic complaining of a lump in her neck. Medical history is significant for uncontrolled diabetes mellitus type 2, hypertension, and hyperlipidemia. Medications include insulin, lisinopril, and atorvastatin. Vital signs are within normal limits. On exam, the thyroid gland is enlarged and firm, with limited movement with swallowing. There are no signs of airway compression. Her body mass index is 33. Laboratory studies include hemoglobin A1c 10.3%, random blood glucose 230 mg/dL, and thyroid-stimulating hormone 2.3 microunit/mL. A fine-needle-aspiration shows fragments of fibrotic tissue and no malignant cells. What is the most appropriate next step in managing this patient?

## Choices:

1. Glucocorticoids
2. Tamoxifen
3. Surgical resection
4. Mycophenolate mofetil

## Answer: 2 - Tamoxifen

## Explanations:

- Tamoxifen is a selective estrogen receptor modulator (SERM) used in the treatment of Riedel thyroiditis and other systemic fibrosing disorders. It induces tumor growth factor-beta (TGF-B), which is a potent growth inhibitor.
- A dose of 10-20 mg, given alone or in combination with prednisone has been successful in decreasing the mass size.
- Although glucocorticoids are the mainstay of medical treatment, this patient has a history of uncontrolled diabetes. Administration of glucocorticoids will elevate blood glucose and thus is inappropriate for this patient.
- Surgery is indicated only to relieve compressive symptoms, and the risk of complications is as high as 39%. The patient will benefit from medical management before escalating to a partial thyroidectomy. Mycophenolate mofetil is an immunosuppressive agent with anti-fibrotic properties which has therapeutic use in systemic fibrosis. Some studies have indicated that a combination of mycophenolate and prednisone, in a case of Riedel thyroiditis not responsive to tamoxifen and prednisone was effective, but further studies are needed.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Riedel Thyroiditis

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 207:

A 71-year old female is seen in the clinic with the complaints of anorexia, weight loss, heat intolerance, and palpitations. Sometimes she feels lightheadedness associated with an increased heartbeat. She complains of not being able to stand up from sitting position for almost two months. Examination of her hands reveals muscle wasting and tremor. What one study will you order in her to determine if she is having any complications from this disorder?

## Choices:

1. Chest x-ray
2. ECG
3. Arterial blood gas
4. Total blood count

## Answer: 2 - ECG

## Explanations:

- This is a case of hyperthyroidism. Elderly people usually tend to have atypical symptoms like anorexia and constipation. In addition, palpitations may also be common.
- However, it is the cardiovascular complications that are more common in the elderly. They may present with atrial arrhythmia, angina, or chest pain. Thus, always get an ECG as many of them do presents with arrhythmias.
- Younger people tend to present with weight loss and diarrhea.
- Other symptoms may include tremor, heat intolerance, and diaphoresis.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hyperthyroidism

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 208:

A 27-year-old nulliparous female patient presents to the clinic with a 5-month history of amenorrhea, decreased axillary and pubic hair, headaches, visual problems, and decreased libido. She has also noticed a white substance leaking from bilateral nipples. The patient takes no medications. Her blood pressure is 132/88 mmHg, pulse 68/min, respirations 14/min, and temperature 98.0 F (36.7 C). On physical examination, galactorrhea is present. Decreased axillary and pubic hair is observed. Visual examination shows bitemporal hemianopsia. Laboratory results show thyroid-stimulating hormone (TSH) 3.4 IU/mL (0.27-4.20), beta-hCG undetectable, and prolactin 175 ng/mL (3.4-24.1). What is most likely to be observed?

## Choices:

1. Decreased serum luteinizing hormone
2. Increased serum estradiol
3. Elevated thyrotropin-releasing hormone
4. Elevated serum insulin-like growth factor-1 levels

## Answer: 1 - Decreased serum luteinizing hormone

## Explanations:

- The patient in this question has symptoms consistent with a prolactinoma. Symptoms include amenorrhea, decreased axillary and pubic hair, headaches, visual problems, and decreased libido. The most common pituitary gland neoplasia is the prolactinoma.
- Hyperprolactinemia is not always due to a prolactinoma, and other causes like pregnancy, drugs, hypothyroidism, and pituitary stalk effect due to other pituitary tumors should be considered in the differential. Females experience irregular menses, decreased libido, and galactorrhea.
- Prolactin has an inhibitory effect on gonadotropin-releasing hormone (GnRH) produced by the hypothalamus. This leads to a decreased serum luteinizing hormone (LH) concentration, which is released from the anterior pituitary. A decreased LH would also lead to a decrease in serum estradiol concentration.
- If prolactin levels are high, a comprehensive metabolic panel, TSH and a pregnancy test (for women of childbearing age) should be obtained. Assessment of other pituitary hormones should be done based on age and gender to exclude any hypopituitarism or other co-secreting tumors. A prolactinoma will cause a decrease in serum luteinizing hormone (LH) concentration.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Prolactinoma

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 209: A 45-year-old man with recurrent nephrolithiasis and subsequent hydronephrosis requiring a right-sided nephrostomy tube, symptomatic hypercalcemia, hypertension, and hyperlipidemia is referred for parathyroidectomy due to severe primary hyperparathyroidism. Immediately postoperatively, the patient is found to have significant and persistent hypocalcemia for three days. Which of the following set of blood test results is most representative and diagnostic of his condition?

## Choices:

1. Low parathyroid hormone, low calcium, low phosphorus
2. Normal parathyroid hormone, low calcium, low phosphorus
3. Elevated parathyroid hormone, low calcium, low phosphorus
4. Normal parathyroid hormone, low calcium, high phosphorus

## Answer: 2 - Normal parathyroid hormone, low calcium, low phosphorus

## Explanations:

- Hypocalcemia, hypophosphatemia, and hypomagnesemia with a normal parathyroid hormone level are the hallmarks of hungry bone syndrome (HBS).
- Parathyroid hormone and phosphorus levels will help to differentiate HBS from other more common post-surgical hypocalcemia causes. Normal PTH with a low phosphorous suggests HBS. Low PTH and high phosphorus would be suggestive of some variant of postsurgical hypoparathyroidism.
- Parathyroid hormone is known as “phosphate trashing hormone” and remembering that helps to evaluate the cause for the hypocalcemia when taking into account the PTH and phosphorus levels. If PTH is low, then the phosphorus should be high.
- In end-stage renal disease, the phosphorus may remain elevated, or rather below-normal even in the setting of HBS as the patient is unable to adequately clear phosphorus due to underlying renal failure.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hungry Bone Syndrome

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 210: A 42-year-old female with a past medical history of rheumatoid arthritis presents with complaints of weight gain, acne, and increased facial hair. What is this patient most at risk of developing?

## Choices:

1. Hypotension
2. Diabetes insipidus
3. Avascular necrosis of the femoral head
4. Metabolic acidosis

## Answer: 3 - Avascular necrosis of the femoral head

## Explanations:

- Patients with inflammatory or autoimmune conditions commonly take corticosteroids. Exogenous corticosteroid use is the most common reason for Cushing syndrome.
- Symptoms of Cushing syndrome include weight gain, particularly in the abdomen, moon facies, and "buffalo hump." A patient may also experience hirsutism, ance, and infections
- Avasular necorisis is a serious complication from exogenous cortisteriod use.
- Other conditions associated with Cushing syndrome are diabetes mellitus and metabolic alkalosis. Hyperlipidemia may also be seen. Diabetes insipidus is a very rare complication of corticosteroids.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Cushing Syndrome

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## Question 211: A 69-year-old male with a previous history of transsphenoidal surgery for the management of Cushing disease five years prior is evaluated by the endocrinologist and the general surgeon for treatment failure. He is now being considered for bilateral adrenalectomy, as he is not controlled with medical therapy. Which postadrenalectomy factor in this patient is most predictive for developing a new pituitary tumor?

## Choices:

1. High levels of plasma adrenocorticotropic hormone
2. High levels of plasma cortisol
3. Old age
4. Male gender

## Answer: 1 - High levels of plasma adrenocorticotropic hormone

## Explanations:

- Risk factors for developing Nelson syndrome have been studied with means of achieving early detection and treatment. High levels of plasma adrenocorticotropic hormone following bilateral adrenalectomy have the strongest predictive capabilities.
- Most of the Nelson syndrome cases are seen as a result of bilateral adrenalectomy for the treatment of Cushing disease.
- It is hypothesized that the loss of feedback inhibition of the hypothalamic-pituitary-adrenal axis leads to the development of an adrenocorticotropic hormone-secreting pituitary tumor.
- Age and sex have not been significantly associated with increased risk; however, younger patients undergoing bilateral adrenalectomy have a higher lifetime risk of developing Nelson syndrome.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Nelson Syndrome

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## Question 212:

An 18-year-old man presents to the clinic for follow-up of a recent diagnosis of hypercholesterolemia. His repeat lipid panel did not show significant improvement following general lifestyle modifications, including a low-fat diet. He is prescribed lovastatin. On a 3-month follow-up, his cholesterol levels have increased. A serum plant sitosterol level is ordered and returns at 134 mg/dL (reference range 80 mg/dL). Which of the following is the next best step in the management of this patient?

## Choices:

1. Add cholestyramine
2. Add ezetimibe
3. Stop lovastatin
4. Start zero fat diet

## Answer: 2 - Add ezetimibe

## Explanations:

- Ezetimibe is the first-line treatment for sitosterolemia.
- General low-fat diets may help with sitosterolemia by also lowering plant sterol intake, but the dietary interventions must be specific in order to lower serum sterol levels. As well, dietary interventions by themselves may not be sufficient without pharmacologic intervention.
- Cholestyramine can be used as an adjunct treatment for sitosterolemia once ezetimibe has been initiated.
- Statin therapy may be continued in patients with sitosterolemia due to its cardioprotective benefits.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hereditary Sitosterolemia

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## Question 213:

A 50-year-old woman presents to the clinic with lethargy, nausea, muscle pains, constipation, and intermittent loin pain for 3 months. Her laboratory reports reveal serum calcium of 11.5 mg/dL and a parathyroid hormone level of 170 pg/mL. She undergoes an ultrasound of the neck that demonstrates parathyroid hyperplasia and a well-defined nodule in the right lobe of the thyroid gland. Fine needle aspiration cytology from the thyroid nodule is suggestive of medullary thyroid carcinoma. She undergoes abdominal ultrasound that reveals non-obstructive left renal calculi and also shows a 2 cm lesion in the right suprarenal region. Which of the following is the next best step in the evaluation of this patient?

## Choices:

1. Octreotide scan
2. Iodine-123 metaiodobenzylguanidine (mIBG) scan
3. Radionuclide renogram
4. Whole-body positron emission tomography

## Answer: 2 - Iodine-123 metaiodobenzylguanidine (mIBG) scan

## Explanations:

- Multiple endocrine neoplasias or MEN type 2a is characterized by parathyroid hyperplasia, medullary thyroid carcinoma, and pheochromocytoma.
- Metaiodobenzylguanidine (mIBG) is a molecule structurally similar to norepinephrine that is taken up by sympathomedullary tumors like pheochromocytoma.
- mIBG can be labeled with Iodine-123 or Iodine-131 and administered intravenously to aid in the diagnosis of pheochromocytoma with high specificity.
- A whole-body fluorodeoxyglucose positron emission tomography (FDG PET-CT ) is also a tumor tracer with lesser specificity for pheochromocytoma compared to an mIBG scan.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Nuclear Medicine Oncology Assessment, Protocols, And Interpretation

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## Question 214:

A 37-year-female presents to her primary care provider for a 3-month history of progressive loss of peripheral vision. She denies headaches, dizziness, weakness, numbness, or tingling. A full review of systems is remarkable only for irregular menses over the past year and sensation of breast tenderness, as well as intermittent nipple discharge over the past few months. Her vital signs are all within normal limits. A neurologic exam reveals bitemporal hemianopsia. Qualitative urine human chorionic gonadotropin (hCG) is negative. Serum prolactin is measured at 250 mcg/L (Normal 20mcg/L in nonpregnant adults and 10-300 mcg/L in pregnant patients). Which of the following results are typically associated with her primary diagnosis in the long term?

## Choices:

1. Decreased bone density for age and an elevated alkaline phosphatase level
2. Decreased bone density for age and a normal alkaline phosphatase level
3. Decreased bone density for age and decreased serum calcium
4. Decreased bone density for age and increased serum calcium

## Answer: 2 - Decreased bone density for age and a normal alkaline phosphatase level

## Explanations:

- In hyperprolactinemia, osteoporosis occurs secondary to low estrogen, a similar process to menopause.
- In circumstances like menopause, there is normal calcium homeostasis, and bone turnover is not increased.
- Serum calcium and alkaline phosphatase are expected to be normal in post-menopausal women, as there is normal calcium homeostasis, and bone turnover is not increased.
- Alkaline phosphatase is typically increased in the setting of increased bone turnover; however, it is non-specific to bone pathologies as it can be affected by other pathologies of other organ systems.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Osteoporosis Markers

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## Question 215:

A 39-year-old female undergoes a thyroidectomy for a mass. Pathology exam reveals a solid mass that stains positive for calcitonin and amyloid. She mentions that one of her brothers also had a similar neck problem. After surgery, the patient should be worked up for which of the following conditions?

## Choices:

1. Recurrent medullary cancer
2. Presence of pheochromocytoma
3. Hypocalcemia
4. Multiple myeloma

## Answer: 2 - Presence of pheochromocytoma

## Explanations:

- Medullary cancer may be sporadic or may occur in a familial fashion.
- Medullary cancer is associated with multiple endocrine neoplasia type 2, which includes parathyroid hyperplasia and pheochromocytoma.
- These individuals with multiple endocrine neoplasia type 2 have a mutation in the RET proto-oncogene.
- Screening for pheochromocytoma involves looking for metanephrines in the urine.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Medullary Thyroid Cancer

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## Question 216:

A 16-year-old female with a past medical history of type 1 diabetes being treated with an insulin pump, presents to the clinic due to frequent hyperglycemic episodes in the morning. She denies snacking at bedtime. A continuous glucose monitor is placed with instructions for followup in one week. Results reveal normoglycemia throughout the night. Around 5 am, the patient's blood sugars begin to increase steadily. What is the next best step in the management of this patient?

## Choices:

1. Avoid carbohydrates at bedtime
2. Increase insulin pump basal rate
3. Begin oral hypoglycemic agent
4. Insulin bolus before breakfast

## Answer: 2 - Increase insulin pump basal rate

## Explanations:

- The dawn phenomenon is defined as an increase in blood sugar in the morning.
- Insulin pumps offer flexibility in setting different basal rates throughout the day to control blood sugar better.
- The dawn phenomenon may be caused by counter regulatory hormones.
- Unlike the Somogyi effect, the dawn phenomenon is not associated with nocturnal hypoglycemia.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Dawn Phenomenon

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## Question 217:

A 16-year-old male presents to the emergency department with abdominal pain and distention. Recently he was treated with high dose steroids for Crohn's disease. Physical examination revealed massive hepatomegaly. Laboratory evaluation showed markedly elevated AST 1,242 IU/L and ALT 602 IU/L with no signs of liver failure. Abdominal ultrasonography revealed an enlarged liver with moderate echogenicity, consistent with steatosis. Extensive evaluation for causes of hepatitis including toxic, autoimmune, genetic, and infectious diseases was unrevealing. Liver biopsy showed no fibrosis or portal inflammation. Swollen hepatocytes were seen. What is the likely underlying mechanism for elevated transaminases?

## Choices:

1. High dose steroids
2. Acute hepatitis.
3. Autoimmune hepatitis
4. NAFLD

## Answer: 1 - High dose steroids

## Explanations:

- High dose steroids elevate glucose levels, gluconeogenesis, and glycogen deposition.
- Lancu and colleagues studied 141 patients who had received steroid therapy, 13% had hepatomegaly and 3 patients had glycogenic hepatopathy.
- Steroids induce hyperglycemia causing increased glycogen production in liver and deposition, by activation of phosphorylase and subsequent activation of glycogen synthase causing deposition of glycogen in the cytoplasm of hepatocytes.
- After discontinuation of steroid therapy, hepatomegaly resolved in all patients.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Glycogenic Hepatopathy

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## Question 218:

A 46-year-old man presents to the hospital with an anterior neck mass and multiple family members on his mother's side with thyroid cancer. He is unsure of the specific type of thyroid cancer that "runs in his family," but his father had papillary thyroid carcinoma. He reports he has had a sister with high blood pressure that proved very hard to control, in addition to other family members with uncontrollable hypertension on his mother's side. Which of the following is most likely to be present in this patient?

## Choices:

1. Angiotensin-converting enzyme levels will be elevated
2. Serum calcitonin level is elevated
3. Family members may have coarse facial features
4. History of multiple and recurrent kidney stones in the family

## Answer: 2 - Serum calcitonin level is elevated

## Explanations:

- Medullary thyroid cancer is a malignant tumor of the thyroid gland and can be associated with MEN 2.
- Tumor cells arise from the C-Cells of the thyroid in contrast to papillary thyroid cancer and follicular tumors, where the malignancy arises from the follicular epithelium.
- A family history of multiple endocrine-derived tumors should prompt consideration; in this case, medullary thyroid carcinoma, pheochromocytoma (leading to refractory hypertension), and potential parathyroid disease.
- Medullary thyroid cancer is associated with multiple endocrine neoplasia type 2, MEN 2 syndrome. Coarse facial features may be a sign of acromegaly, seen in MEN I syndrome due to pituitary adenoma.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Medullary Thyroid Cancer

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## Question 219:

A 40-year-old woman presents to the emergency department complaining of nausea, vomiting, abdominal pain, diarrhea, and jaundice for 3 weeks. She has a history of alcohol-induced cirrhosis. On physical examination, vital signs show blood pressure 120/80 mmHg, pulse rate 100/min, and temperature 98 F. She also has eruptive yellow-white plaques on her elbows and knees. An initial set of investigations is significant for elevated ALT, AST, total bilirubin, and lipids. Which of the following is the next best test in the evaluation of this patient?

## Choices:

1. Lipoprotein A
2. Lipoprotein C
3. Lipoprotein X
4. Apo C

## Answer: 3 - Lipoprotein X

## Explanations:

- Lipoprotein x causes severe hyperlipidemia in patients with liver dysfunction.
- Lipoprotein X-induced hyperlipidemia causes xanthomas in extensor surfaces.
- Lipoprotein X has a similar density as LDL, causing false elevation of LDL in lab values.
- Lipoprotein X does not increase atherosclerosis.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Lipoprotein X Induced Hyperlipidemia

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## Question 220:

A 65-year-old woman was admitted to the hospital with septic shock secondary to pyelonephritis six months ago. She was started on steroids at that time and was discharged on hydrocortisone 15 mg in am and 5 mg in pm. She is referred to you for further management of steroids. She feels well overall and does not have any acute complaints. There are no orthostatic symptoms. Apart from adrenal insufficiency, her past medical history is significant for gastroesophageal reflux. Her only other medication is omeprazole 20 mg twice a day for acid reflux. Physical examination, including vital signs, is normal. Laboratory results show normal electrolytes, including blood count, electrolytes, and renal function. What is the best strategy regarding her steroids?

## Choices:

1. 250 mcg cosyntropin stimulation test after holding hydrocortisone and resume hydrocortisone after the test
2. Stop hydrocortisone, there is no need to check any further labs as she feels well
3. 250 mcg cosyntropin stimulation test but do not hold any steroid doses
4. Continue hydrocortisone lifelong

## Answer: 1 - 250 mcg cosyntropin stimulation test after holding hydrocortisone and resume hydrocortisone after the test

## Explanations:

- Cosyntropin stimulation test (CST) is a dynamic test frequently used for evaluation of the Hypothalamus Pituitary Adrenal (HPA) axis in suspected adrenal insufficiency (AI). Adrenal insufficiency is a potentially life-threatening condition with a very variable clinical presentation and requires a high level of clinical suspicion for diagnosis. Without timely intervention, untreated AI can lead to grave complications, including death.
- AI can be diagnosed if cortisol is unequivocally low, but intermediate or higher levels need further evaluation by CST. Administration of supraphysiological dose of synthetic ACTH or Cosyntropin stimulates the pituitary and thereby release of cortisol from the adrenal cortex as long as the adrenals cortex has a functional reserve. High dose (250 mcg) CST is standard and routinely used as dynamic testing for evaluation of the HPA axis.
- CST involves checking cortisol levels at baseline, 30 minutes and 60 minutes after IV or IM administration of 250 mcg Cosyntropin. A negative (normal) result is if the cortisol level is stimulated to > 500-600 nmol/L. A positive (abnormal or subnormal) result could be from primary or central and can be further evaluated by ACTH levels. ACTH level is expected to be high with primary and low with central AI.
- One of the most common causes of false-positive tests, especially in a hospital setting, is the recent use of the steroid. Steroids, in any form, IV, IM, intrathecal, oral, or inhalational, can suppress the HPA axis and decrease intrinsic cortisol production. Exogenous steroids decrease both baselines as well as adrenal responsiveness to Cosyntropin and can cause false-positive results.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Adrenocorticotropic Hormone Test

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## Question 221: A 12-year-old girl is brought to the clinic because her mother noticed a yellowish plaque forming around her eyelids. The mother also had these yellowish plaques around her eyelids and tendons and was diagnosed with a cholesterol disorder. The mother states that her mother, grandfather, and brother all have had a similar cholesterol disorder. The patient's LDL levels measure 195 mg/dL. She is started on a statin but develops severe myalgia shortly after. What is the next best medication to switch the patient to?

## Choices:

1. Cholestyramine
2. Baby aspirin
3. Niacin
4. PCSK9 Inhibitor

## Answer: 1 - Cholestyramine

## Explanations:

- Some bile acid sequestrants (BAS) are FDA approved for adolescent patients (10-17 years of age).
- BAS are very useful in patients who are statin intolerant (myalgia and myopathy) and can be used in combination with other medications to achieve target goals.
- Studies have identified that cholestyramine can safely be used in children with type II hyperlipoproteinemia, as with this patient, and can be an effective way to lower their cholesterol levels.
- Baby aspirin may be used in preventing cardiovascular disease in this patient, but it will not have an effect on cholesterol levels. Niacin can be used to moderately lower cholesterol levels, but it is generally not as effective as BAS. Lifestyle changes are generally not effective in patients with type II hyperlipoproteinemia, and medications are usually needed to lower cholesterol to an optimal level.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Antilipemic Agent Bile Acid Sequestrants

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## Question 222:

A 69-year-old woman lost 31 kg in a year after bariatric surgery, and she has been able to maintain her lost weight. She has a 9-year history of type 2 diabetes mellitus. Four months after the surgery, she had lower hemoglobin A1c and triglycerides. She preferably consumes fermented dairy products, high fiber foods, and a protein-enriched diet. She goes jogging for at least 30 minutes, three days a week. She feels very concerned because she gained 2 kg in the last month, and she needs more insulin for glycemic control. She did not change her diet in the last month, but she received antibiotics to treat pneumonia. Which of the following best explains her weight increase?

## Choices:

1. Fermented dairy products
2. Food enriched in simple carbohydrates
3. Recent illness and treatment
4. Bariatric surgery complication

## Answer: 3 - Recent illness and treatment

## Explanations:

- Antibiotics can induce changes in the gut microbiota that could affect weight.
- It is important to clarify that the effects of antibiotics on gut microbiota and metabolism are dependent on host and antibiotics types. Sedentarism could explain weight regain.
- Prebiotic and probiotics in humans can modulate microbiota or achieve weight loss by different mechanisms. The effect of antibiotics on gut microbiota can last up to two years. The application of appropriate antibiotics may facilitate the recovery of the metabolic balance of obese individuals. After bariatric surgery, the causes depending on the surgery can be related to the loss of restriction, but it is a rare cause of weight regain.
- Generally, in human research, there are reports about the consumption of probiotics; for example, fermented dairy products lead to losing weight by modifying the gut microbiota. The patient consumes a higher percentage of fiber and proteins than simple carbohydrates. The intake of monosaccharides, disaccharides, and oligosaccharides could relate to the ingestion of dairy products. Perhaps, it would be necessary to deepen the aspects of the food plan, but in this patient, it is unlikely to check a high intake of simple carbohydrates.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Weight Gain Prevention Strategies

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## Question 223:

A 65-year-old woman with a BMI of 50 kg/m2 presents to the clinic for follow up. Her mother, who had rheumatoid arthritis, was diagnosed at age 45 with osteoporosis, and the patient is concerned whether she needs any testing for osteoporosis. She has no personal diagnosis of rheumatoid arthritis, although she does report a history of back pain and degenerative disc disease at the level of L3-L5. She also has a history of type 2 diabetes, hypertension, and vitamin D deficiency. Which of the following is the most appropriate recommendation for this patient?

## Choices:

1. No need for bone mineral density testing
2. DEXA (dual-energy x-ray absorptiometry) scan
3. Bone mineral density of L1-L4 using radiographs
4. Quantitative CT (QCT)

## Answer: 4 - Quantitative CT (QCT)

## Explanations:

- The patient meets screening guidelines based on her age. In addition, her vitamin D deficiency puts her at risk for osteoporosis.
- Knowing that she has degenerative disc disease makes using radiographs less useful and quantitative CT more appropriate.
- Her morbid obesity also makes quantitative CT more appropriate.
- Although there are no contraindications to performing DEXA, severe degenerative changes or fracture deformity in the measurement area make it of less value.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Dual Energy X-ray Absorptiometry

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## Question 224:

A 28-year-old male with type 1 diabetes mellitus recently started physical therapy for a strain of the right lateral thigh musculature caused by a work accident. The patient is on a basal-bolus insulin regimen, and his last HbA1c was 6.0%. The patient normally leads a sedentary lifestyle and is concerned about how his physical therapy will affect his blood glucose control. What is the best recommendation for this patient?

## Choices:

1. The right thigh should continue to be used as the exercises will not affect insulin absorption
2. Patient is no longer diabetic and can discontinue insulin injections
3. The exercises will speed the insulin absorption, but the site can still be used
4. Another site should be used if leg exercises are planned

## Answer: 4 - Another site should be used if leg exercises are planned

## Explanations:

- Exercise of the muscles at the site of an insulin injection will increase the rate of absorption; therefore, other sites should be used.
- Aerobic training will increase mitochondrial density, insulin sensitivity, oxidative enzymes, the reactivity of blood vessels, lung function, immune function, and cardiac output. Aerobic activity is associated with lower cardiovascular and mortality risks in both type 1 and type 2 diabetes mellitus. High-intensity interval training will promote the rapid enhancement of skeletal muscle oxidative capacity, insulin sensitivity, and glycemic control in adults with type 2 diabetes mellitus and can be performed without deterioration of glycemic control in those with type 1 diabetes mellitus.
- Diabetes mellitus is a risk factor for low muscular strength and an accelerated decline in muscle strength. The health benefits of resistance training include improvements in muscle mass, body composition, strength, physical function, mental health, bone mineral density, insulin sensitivity, blood pressure, lipid profiles, and cardiovascular health.
- Patients with type 1 diabetes mellitus need insulin.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Diabetes Mellitus And Exercise

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## Question 225:

A 51-year-old woman comes to the physician for a routine health maintenance examination. She has type 2 diabetes mellitus, for which she takes metformin. The patient mentions occasional headaches and shortness of breath on exertion. She is 166 cm (5 ft 5 in) tall and weighs 98 kg (216 lb); BMI is 36 kg/m2. Her blood pressure is 145/93 mm Hg. Physical examination shows central obesity, with a waist circumference of 104 cm (41in). Chest auscultation within normal limits. Serum studies show triglycerides 180 mg/dL, HDL cholesterol 35 mg/dL, total cholesterol 220 mg/dL, fasting glucose 103 mg/dL. This patient is at greatest risk for which of the following conditions?

## Choices:

1. Hypothyroidism
2. Neurocognitive impairment
3. Steatohepatitis
4. Progressive bone loss

## Answer: 3 - Steatohepatitis

## Explanations:

- Metabolic syndrome is characterized by obesity (abdominal girth >40" men, >35" women), low HDL cholesterol, high triglycerides (>150 mg/dL), hypertension, and fasting glucose >100.
- About 25% of adults in the United States meet the criterion for metabolic syndrome.
- Increased complications with metabolic syndrome include non-alcoholic steatohepatitis (NASH), polycystic ovarian syndrome, insulin resistance, obstructive sleep apnea, hypogonadism, lipodystrophy, microvascular and chronic renal disease, and coronary artery disease.
- There is also a 30% increase risk for nephrolithiasis.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Metabolic Syndrome

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## Question 226:

A 40-year-old female presents to the emergency department with an increased pulse. She says that this has been happening for a couple of hours. She adds that she feels anxiety and palpitations. Her vitals include a blood pressure of 130/87 mmHg, a pulse of 115 beats per minute, respiration of 15 breaths per minute and a temperature of 98.7 degrees Fahrenheit. Further evaluation of blood shows that thyroid-stimulating hormone (TSH) is suppressed at 0.3 mU/L (0.5-4.5 mU/L). Free T4 is slightly over the normal limit at 1.6 ng/dL (.5 - 1.5 ng/dL). Upon reviewing medical records, the provider finds images of a recent radio-iodine uptake scan. What is the probable diagnosis of a patient that exhibits a low radioiodine uptake on the exam?

## Choices:

1. Hashimotos Thyroiditis
2. Central hypothyroidism
3. Graves disease leading to hyperthyroidism.
4. Toxic nodular disease

## Answer: 1 - Hashimotos Thyroiditis

## Explanations:

- A radioiodine uptake test will be low in patients who have an inflammatory disease in their thyroid, eg, Hashimoto's thyroiditis. This subtle hyperthyroid picture will lead to hypothyroidism eventually.
- This patient has a mild form of Hashimoto's thyrotoxicosis, which remains undiagnosed in most of the cases. This patient should be treated with beta-blockers to have a heart rate of less than 110 beats per minute for a temporary basis. This helps with cardioprotection as well as improves the symptoms.
- Eventually, this patient will develop hypothyroidism which will need monitoring and ultimately treatment with levothyroxine.
- Decreased uptake is seen in primary hypothyroidism, post-thyroidectomy, excess iodine, after use of radiological contrast and amiodarone. Increased uptake is seen in Graves disease where the gland will have diffuse uptake. The toxic nodular disease will show increased focal uptake.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hypothyroidism

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## Question 227:

A 10-year-old boy is brought to the emergency department with a complaint of painful swelling of the right toe. On examination, the right toe is warm, erythematous, and tender on palpation. Aspiration of the joint reveals uric acid crystals. Lab investigations show a blood glucose level of 56 mg/dL and a lactic acid level of 3 mmol/L. Hepatomegaly is found on the abdominal examination. Which of the following interventions is likely to prevent future episodes in this patient?

## Choices:

1. Increased intake of diet rich in fats
2. Increased water intake to prevent dehydration
3. Increased intake of oral starch and avoidance of fruits and milk
4. Increased supplementation with vitamin B6

## Answer: 3 - Increased intake of oral starch and avoidance of fruits and milk

## Explanations:

- This patient likely has type I glycogen storage disease who has presented with an episode of acute gout. An inability to synthesize glycogen, for example in GSD type II or an inability to properly release glucose from glycogen can result in hypoglycemia and exercise intolerance.
- Hypoglycemia in glycogen storage disease results in the body utilizing the other sources of energy like fats and anaerobic metabolism causing lactic acidosis. The lactic acid competes with uric acid for transport in the renal tubules as a result uric acid builds up in the body. The uric acid may precipitate in the joints, leading to gout.
- The treatment involves frequent oral intake of glucose or starch to prevent episodes of hypoglycemia and increased blood lactate levels. These patients can not metabolize milk and fruit sugar either resulting in the toxic accumulation of glycogen in the body.
- The inability to properly release glucose from glycogen can result in the abnormal accumulation of glycogen. In the liver, for example with GSD type IIIb and IIId, this can result in hepatomegaly with the potential for cirrhosis. In skeletal muscle as in GSD V, this can prevent proper muscle functioning, exercise intolerance, and rhabdomyolysis.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Glycogen Storage Disease

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## Question 228:

A 65-year-old female presents to the clinic with progressively worsening polyuria and polydipsia that developed in the last six months. She also complains of progressive unintended weight loss, malaise, and admits to a 43 pack-year history of tobacco abuse. The patient's most recent hemoglobin A1c is 8.3% and has not improved after one-year of low dose metformin therapy. The patient has elevated blood pressure, and the physical exam reveals hyperpigmented raised extensive striae on her abdomen and thighs, which she states have developed recently. A chest x-ray reveals a 3-centimeter pulmonary mass near the right mainstem bronchus in addition to hyperinflated lung fields. Lab testing demonstrates non-suppressible serum cortisol following an overnight 1 mg dexamethasone test with random ACTH on repeated measures in the 60-120 pg/mL range. Which of the following is the most effective strategy for achieving sustained improvement in glycemic control and quality of life for this patient?

## Choices:

1. Commencement of treatment with mitotane to address the hypercortisolemia in this patient.
2. Immediate initiation of insulin therapy with dose titration to get the glycemia to desired goals.
3. Arranging urgent consultation with the pulmonary and cardiothoracic surgical teams for biopsy and resection surgery of pulmonary mass.
4. Commencement of therapy with mifepristone or ketoconazole to ameliorate the hypercortisolemia of the patient

## Answer: 4 - Commencement of therapy with mifepristone or ketoconazole to ameliorate the hypercortisolemia of the patient

## Explanations:

- This patient's clinical presentation is consistent with ectopic ACTH syndrome with secondary hypercortisolemia and this is the central basis for most of her recent symptoms including the deterioration of her quality of life and worsening glycemic status. Central to improving her glycemic control and quality of life is reducing the ambient hypercortisolemia. Mifepristone or ketoconazole therapy would be the most effective and sustainable pharmacologic strategy to achieve quick glycemic control in this patient.
- Mifepristone or ketoconazole therapy is the best strategy to achieve glycemic control as soon as possible and is thus the correct answer. Insulin initiation may help improve her glycemic control but would not address any of her other clinical, metabolic and systemic derangements due to her hypercortisolemia.
- The identified lung mass is ominous and suggests a possible underlying etiology of small cell lung carcinoma in this long term smoker. While this patient does need to have a lung biopsy and possible resection surgery that would be best done after her clinical status is improved by better management of her hypercortisolemia and glycemia and is not the primary management intervention required at this stage of her care.
- The glucocorticoid and progesterone receptor antagonist mifepristone (Korlym or RU-486) and adrenal synthetic enzymes inhibitors like ketoconazole are among the pharmacologic interventional strategies to address hypercortisolism.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hypercortisolism

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## Question 229:

A 10-day-old girl is admitted to the pediatric intensive care unit with refractory seizures. Her prenatal history was unremarkable, except for hiccuping noted in utero. After birth, the patient started to have seizure activity and is noted to be encephalopathic and hypotonic. A septic workup for inborn errors of metabolism is initiated, including laboratory evaluation of the patient's cerebrospinal fluid, urine, and blood. Based on the patient's clinical presentation. Which of the following diagnostic test results is most consistent with this patient's diagnosis?

## Choices:

1. Elevated glycine cerebrospinal fluid to plasma ratio of greater than 1
2. Hyperammonemia
3. Metabolic acidosis with elevated lactate, abnormal organic acids
4. Metabolic Acidosis with elevated lactate, normal pyruvate

## Answer: 1 - Elevated glycine cerebrospinal fluid to plasma ratio of greater than 1

## Explanations:

- A neonate that presents with seizures, lethargy, hypotonia and a prenatal history of hiccuping is concerning for nonketotic hyperglycinemia.
- Diagnostic workup for this condition consists of a blood and cerebrospinal fluid analysis glycine with specific attention to the glycine cerebrospinal to plasma ratio.
- An elevated glycine cerebrospinal fluid to plasma ratio is consistent with nonketotic hyperglycinemia.
- An elevated ammonia level is concerning for a urea cycle defect. Metabolic acidosis with ketosis and normal lactate is concerning for maple syrup urine disease. Metabolic acidosis with elevated lactate and abnormal organic acids is concerning for other organic acidemias such as methylmalonic acidemia, propionic acidemia, isovaleric acidemia, or multiple carboxylase deficiency. A patient with metabolic acidosis and a high lactate/pyruvate ratio are concerning for mitochondrial disorders.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Nonketotic Hyperglycinemia

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## Question 230:

A 7-year-old female who had been diagnosed with hypothalamic hamartoma at five years of age due to occasional gelastic seizures and a magnetic resonance imaging showing a 7 mm suspicious lesion is now presenting symptoms of precocious puberty. She has developed pubic hair, and breasts have started to develop in the last six months. Last month, she had her first vaginal bleeding. What is the best management for the precocious puberty?

## Choices:

1. Leuprolide acetate
2. Temozolomide
3. Stereotactic thermoablation
4. Gamma knife radiosurgery

## Answer: 1 - Leuprolide acetate

## Explanations:

- Precocious puberty can usually be treated successfully with medications. Leuprolide acetate inhibits the release of a gonadotropin-releasing hormone that is required to trigger puberty. It is usually administered intramuscularly once-monthly for the duration that puberty needs to be suppressed.
- Symptoms of precocious puberty are relevant if they initiate before the age of 8 years in girls and 9 in boys. It has been noted that in hypothalamic hamartoma patients, symptoms can present as early as one year of age. These may consist of short stature, breast development, pubic hair presence, maturation of sexual reproductive organs, deepening voice, and acne.
- Patients also can present with isolated precocious puberty with lesions attached mainly to the anterior portion of the hypothalamus near the tuber cinereum and appear pedunculated below the third ventricle.
- A classic symptom of hypothalamic hamartoma is partial seizures accompanied by laughter (gelastic seizures). Precocious puberty can present alone or in combination with the gelastic seizures.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hypothalamic Hamartoma

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## Question 231:

A 40-year-old woman presents with an incidentally-discovered neck mass below her "Adam's apple." She noticed this in the shower 3 weeks ago and is unsure how long it has been there. It does not appear to have changed since she's noticed it. She is a lifelong non-drinker for religious reasons but is a current daily smoker, 1/2 pack/day, and has been since the age of 14. She has a medical history significant for hypertension controlled with lisinopril as well as two kidney stones treated with lithotripsy, most recently 2 years ago. On examination, there is a 1 cm palpable neck mass just above her right thyroid that elevates with swallowing. There are no other appreciable prominent lymph nodes or masses. Her voice is strong, and Chvostek's sign is negative. She has a recent CT scan of the neck and chest performed after a road traffic accident that revealed: "sub-centimeter nodules in the right lung apex with well-defined borders, recommend long-term surveillance but cannot definitively rule out malignancy." What is the next best step in the management of this patient?

## Choices:

1. Fine-needle aspiration of the neck mass
2. Interventional radiology consult for a fine-needle aspirate of a lung mass
3. Thyroid and parathyroid function studies
4. Ultrasound of the neck

## Answer: 1 - Fine-needle aspiration of the neck mass

## Explanations:

- Any new neck mass requires a tissue diagnosis.
- Parathyroid carcinoma is rare, but pathology can distinguish benign from malignant pathology in most instances.
- The lung lesions have a long list of potential causes, and diagnosis of the neck lesion is more urgent.
- The differential for a peri-thyroid mass is extensive and can be most easily narrowed with a pathology sample on fine-needle aspiration (FNA).

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Parathyroid Cancer

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## Question 232: A 47-year-old patient with a 6-year history of type 2 diabetes mellitus presents to the clinic complaining of polydipsia and polyuria. She is currently taking atorvastatin, ramipril, and metformin. On investigation, the patient's HbA1c is at 88 mmol/L (normal value; 42 mmol/L). What is the next step in the management of this patient?

## Choices:

1. Increase dose of atorvastatin
2. Switch to insulin
3. Stop metformin and start sulfonylurea
4. Continue metformin and add sulfonylurea

## Answer: 4 - Continue metformin and add sulfonylurea

## Explanations:

- The patient is not showing intolerance to metformin and has poor diabetes control. Dual therapy is recommended.
- Make sure to warn the patient of potential hypoglycemia. Inform them to be able to recognize symptoms such as nausea, palpitations, and dizziness.
- Take appropriate measures in ensuring the safety of a patient when commencing sulfonylureas.
- Switching to insulin is not recommended at this stage and it is only indicated after failure to control HbA1c while on triple-drug therapy. e.g. metformin, glimepiride and sitagliptin.

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## Research Concepts:

### Glimepiride

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## Question 233:

A 56-year-old man was brought to the emergency department with a history of intermittent fever in the past 4-5 days. He was a diabetic and hypertensive on irregular medications. On examination, the patient was in altered mentation. His blood pressure was 158 /100 mmHg, and the heart rate was 122/min, respiratory rate 34/min, saturation100 % on room air. On closer evaluation, he was noted to have swelling and drooping of the right eyelid & his right pupil was fixed and dilated. His partner now says that she had noticed an unusual scanty black discharge at the right nostril in the previous night. Further evaluation of the nasal cavity with this additional input revealed a blackish eschar at the right nasal septum with exposed bone. His ABG on 2 liters of oxygen shows a PaO2 136 mm Hg and PaCO2 18 mmHg, pH 7.113, and base excess -14 mEq /L. The bedside blood sugar was 478 mg/dl, and urine ketone was strongly positive. Sodium is 126 mEq/L, potassium is 5.1 mEq/L, and chloride is 102 mEq/L. What is the next best step in this patient?

## Choices:

1. Computed tomography scan brain
2. Sinus radiography
3. Magnetic resonance imaging sinus and orbit
4. Lumbar puncture

## Answer: 3 - Magnetic resonance imaging sinus and orbit

## Explanations:

- This patient with high blood sugar, high anion gap metabolic acidosis, and urinary ketone positivity indisputably fits into the diagnosis of diabetic ketoacidosis. There is a high incidence of rhino-orbital cerebral mucormycosis in diabetes, and a large majority of such diabetic patients may have associated acidosis or ketoacidosis. Given the features of sinusitis, eschar in the nasal septum, eye involvement, and altered sensorium with a background of diabetic ketoacidosis, rhino-orbital cerebral mucormycosis is a strong consideration.
- Suspicion or diagnosis of rhino-orbital cerebral mucormycosis triggers a medical as well as a surgical emergency. Urgent magnetic resonance imaging will show or rule out evidence of fungal sinusitis with orbital involvement and intracranial extension, which are classic findings in rhino-orbital cerebral mucormycosis. If there is strong clinical suspicion and/or abnormalities are detected on imaging, intravenous amphotericin (preferably liposomal) is started at the earliest possible. Magnetic resonance imaging or computed tomography is also required for the planning of surgical exploration and aggressive debridement. Otorhinolaryngology or ophthalmology and neurosurgeons are usually involved in the debridement process, and the extensive debridement not only reduces the fungal load but also provides tissue biopsy for the frozen section to help early diagnosis.
- Management of diabetic ketoacidosis is one of the first steps in the initial management in this case. High blood sugar will impair phagocytosis, which in turn favors the survival and growth of the fungal hyphae. Other mechanisms that promote fungal growth include hyperglycosylated of iron sequestering proteins, which results in increased iron sequestration, thereby promoting the fungal growth and also increased expression of mammalian GRP 78 the mammalian receptors, which increases the cellular binding to Mucorales.
- The very fact that this ubiquitous fungus very rarely causes the devastating disease highlights the role of innate immunity in protecting the entire humans. Rhino-orbital mucormycosis almost always occurs in the immunocompromised state, including uncontrolled diabetes mellitus, steroid therapy, chronic kidney disease, and solid organ transplant recipients, to mention a few. Rare reports of this disease in immunocompetent individuals (probably unknown immune defect) are available in the literature. Rhino-orbital cerebral aspergillosis and chronic allergic fungal sinusitis are close differential diagnosis.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Rhino-orbital Cerebral Mucormycosis

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## Question 234: A 25-year-old woman presents to the emergency department with complaints of nausea, palpitations, and heat intolerance. She is currently breastfeeding her 3-month-old infant. She has a heart rate of 102/min and a basal metabolic index of 16 kg/m2. She reports to the clinician that she is concerned about the quality of her breast milk because her infant is not gaining appropriate weight, so she has been steadily increasing her dietary supplements. What is the best initial step in the management of this patient?

## Choices:

1. Reassurance and referral to women's health services
2. Discontinue the dietary supplements and start levothyroxine
3. Discontinue dietary supplements and start IV fluids with antiemetics
4. Order a CT abdomen/pelvis and consult general surgery for possible appendicitis

## Answer: 3 - Discontinue dietary supplements and start IV fluids with antiemetics

## Explanations:

- The patient should discontinue her dietary supplements which are leading to iodine-induced hyperthyroidism.
- The patient is experiencing symptoms of hyperthyroidism, not hypothyroidism.
- The patient is experiencing iodine-induced hyperthyroidism. Her pre-existing iodine deficiency led to the development of TSH resistant thyroid nodules. These nodules then overproduced thyroid hormones in response to a sudden iodine supply. This results in symptoms of hyperthyroidism, palpitations, and heat intolerance.
- While the patient is nauseated, her history is not consistent with appendicitis.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Iodine Toxicity

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## Question 235:

A 13-year-old male comes to the clinic for his annual check-up. During the visit, his mother complains that for the past 3 months, he is always in a bad mood and he does not want to go to swimming sessions anymore. When the boy is asked why, he replies that he feels very uncomfortable because he has small testes. On physical examination, he has a Tanner stage of 3 of testes, and he is at the 50th percentile for height and weight. He is diagnosed with pubertal delay. What is the most likely inhibitory mechanism of GnIH action in gonadotropes?

## Choices:

1. Stimulates the synthesis and release of LH and FSH
2. RFamide peptide with C terminal that inhibits the cAMP-related signaling pathway triggered by GnRH in gonadotropes
3. Induces cAMP accumulation and a sustained elevation of cytosolic Ca2+ concentration in corticotrophs
4. Displays the classical heptahelical structure of G protein-coupled receptors with the lack of a C-terminal tail

## Answer: 2 - RFamide peptide with C terminal that inhibits the cAMP-related signaling pathway triggered by GnRH in gonadotropes

## Explanations:

- GnIH belongs to the family of RFamide-related peptide (RFRP). All RFRP's carry an LPXRF-amide (X represents L or Q) motif at their C termini. GnRH is mediated by the Gaq/11-coupled pathway but lacks C terminal.
- GnIH neurons project to the median eminence to control anterior pituitary function via GnIH-R expressed in gonadotropes and play as a brake by preventing the excessive action of stimulatory inputs to maintain the balance in the reproductive system.
- GnIH receptor is a G protein-coupled receptor 147 (GPR147) which works through the Gai protein to inhibit cAMP production by reducing intracellular cAMP levels, and protein kinase A activity and this translates into the inhibition of synthesis and release of the gonadotropin hormones FSH and LH.
- Besides the effects of GnIH with the HPG axis, it may also act directly at the gonadal level along with other endocrine systems like adrenal and thyroid since reproductive axis interacts with them.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Physiology, Gonadotropin Inhibitor

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## Question 236: What is the Kocher test used to assess?

## Choices:

1. Mobility of the duodenum
2. Tracheal obstruction by a thyroid mass
3. Varicose veins
4. Palpable lymph nodes

## Answer: 2 - Tracheal obstruction by a thyroid mass

## Explanations:

- When there is a very large thyroid gland one can perform the Kocher test to determine if the trachea is compressed.
- The patient should be asked to inspire deeply as pressure is applied to the lateral lobe.
- If tracheal compression occurs, the pressure will produce stridor on deep inspiration.
- Note this is different from the Kocher maneuver where the duodenum is mobilized to visualize the retroperitoneum.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Nontoxic Goiter

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## Question 237:

A 34-year-old woman with type 2 diabetes mellitus presents to the hospital with malaise and vomiting for three days. She is 24 weeks pregnant and has been using less insulin than before because of decreased oral intake and normal serum glucose values. She is concerned about the presence of a large amount of urinary ketones. Laboratory studies show a serum pH of 7.00, bicarbonate of 9 mEq/L, beta-hydroxybutyrate of 22 mmol/L, potassium of 5.1 mEq/L, anion gap of 28 mmol/L, and glucose of 130 mg/dL. What is the most appropriate treatment for this condition?

## Choices:

1. Intravenous ondansetron
2. Intravenous dextrose 5% with insulin 0.05 U/kg/hr infusion
3. Intravenous insulin 10 U/hr infusion
4. Intravenous lactated Ringer's solution

## Answer: 2 - Intravenous dextrose 5% with insulin 0.05 U/kg/hr infusion

## Explanations:

- Euglycemic diabetic ketoacidosis may be present in patients with type 1 diabetes with a recent change in the dosing of insulin, but can also be triggered in patients with type 2 diabetes. The usual triggers are pregnancy, abdominal surgery (particularly bariatric surgery), fasting, and the use of sodium-glucose cotransporter 2 (SGLT2) inhibitors.
- Euglycemic diabetic ketoacidosis is diagnosed when there is blood glucose of less than 250 mg/dL, pH of less than 7.3, serum bicarbonate of less than 18 mEq/L, and ketonemia.
- The primary treatment of euglycemic diabetic ketoacidosis is with both dextrose (5% to 10%) and insulin (0.05-0.1 U/kg/hr) infusion (once serum potassium is known to be above 3.3 mEq/L).
- EDKA treatment also includes intravenous hydration, antiemetic agents, and replacement of electrolytes.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Euglycemic Diabetic Ketoacidosis

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## Question 238:

A 16-year-old female presents to the clinic with complaints of neck swelling hand tremors and weight loss despite an increased appetite. She has no significant family history of endocrine diseases. On examination, bulging eyes are seen, but she has full eye-closure; nevertheless, you are concerned she has Graves disease. Which physical examination technique would be of the highest-yield in confirming this diagnosis?

## Choices:

1. Observation
2. Palpation
3. Auscultation
4. Ocular motility

## Answer: 3 - Auscultation

## Explanations:

- Riesman's sign or Snellen-Riesman's sign is a clinical sign characterized by bruit heard over the closed eye with a stethoscope in Graves' ophthalmopathy in thyrotoxicosis. The bruit is heard during systole.
- Typically, the cone-shaped long and narrow bell of Ford-Bowles telescope should be used to listen to the faint sound of ocular bruit.
- The Snellen Riesman sign is due to the hyperdynamic circulation and increased cardiac output in thyroid eye disease and hyperthyroidism.
- Similar bruit over the closed eye may also be heard in multiple conditions including carotid-cavernous fistula, stenosis of the internal carotid artery, and severe anemia.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Riesman Sign

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## Question 239:

A 32-year-old white woman presents to the clinic with ongoing symptoms of fatigue, nausea, weight loss, and darkening of skin for the last four weeks. The patient has a history of diabetes mellitus type 1. Her vitals show blood pressure 110/80 mmHg, pulse 60/min, temperature 38 C, and respiratory rate 14/min. Cortisol (8 AM) level is 3 mcg/dL (reference range: 5-25 mcg/dL) and ACTH level is 70 pg/mL (reference range: 10-60 pg/mL). Which of the following additional problems is most likely to occur in this patient?

## Choices:

1. Primary hypothyroidism
2. Diabetes mellitus type 2
3. Cushing disease
4. Primary hyperparathyroidism

## Answer: 1 - Primary hypothyroidism

## Explanations:

- The clinical vignette is most consistent with polyglandular autoimmune syndrome type 2, which is also known as Schmidt syndrome and Carpenter syndrome.
- Polyglandular autoimmune syndrome type 2 is an autoimmune syndrome that leads to lymphocytic infiltration causing organ-specific damage.
- Addison disease, autoimmune thyroid disease, and diabetes mellitus type 1 are the most common manifestations of polyglandular autoimmune syndrome type 2.
- Polyglandular autoimmune syndrome type 2 is three times more common in women, and the typical age of onset is between 20-40 years.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Polyglandular Autoimmune Syndrome Type II

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## Question 240:

A 60-year-old male presented to the emergency department with pain in the right upper abdomen. Abdominal examination was unremarkable. Ultrasound abdomen showed the presence of a hyperechoic mass exhibiting a "split diaphragm" sign in the right suprarenal region with undefined margins. Contrast-enhanced computed tomography (CECT) scan of the abdomen revealed a well-defined, round lesion in the right suprarenal region with heterogeneous attenuation. Which of the following is the most likely diagnosis?

## Choices:

1. Neuroblastoma
2. Adrenal myelolipoma
3. Pheochromocytoma
4. Adrenocortical carcinoma

## Answer: 2 - Adrenal myelolipoma

## Explanations:

- Adrenal myelolipomas are the second most common adrenal incidentalomas comprising 6 to 16% of adrenal incidentalomas
- On ultrasound, they are often uniformly hyperechoic. Unlike adrenal hemorrhage, which also can be hyperechoic, myelolipoma shows a "split diaphragm" sign because of the different rate of sound transmission in fat.
- CT is the preferred imaging modality for the diagnosis of adrenal myelolipoma. It is seen as a hypodense well-circumscribed heterogeneous mass with an attenuation value of -90 to -129 HU. Almost all myelolipomas have some focus of fat, although the fatty tissue focus may be very small. Large amounts of fat are frequently encountered with “smoky” or "variegated" areas of interspersed higher-attenuation tissue. This denser tissue has attenuation values of 20 HU to 30 HU, inferring the presence of both fat and myeloid elements.
- Most adrenal myelolipomas are small and asymptomatic.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Adrenal Myelolipoma

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 241:

A 28-year-old female with a past medical history of type 1 diabetes was brought to the emergency department as she was complaining of diffuse abdominal pain, fatigue and weight loss for the past 3 weeks. She noticed frequent hypoglycemia episodes in the last 3 weeks despite no changes in her insulin regimen. Her diabetes has been well controlled for many years on an insulin pump and her last hemoglobin A1C was 6.8% 2 months ago. In the emergency department, she had a seizure episode and blood glucose was found to be 28 mg/dl. She was given dextrose and insulin pump was discontinued. The patient has a family history of celiac disease in her sister and multiple sclerosis in her mother. On physical exam, she was confused. The abdominal exam revealed diffuse tenderness, without rebound tenderness. She had normal deep tendon reflexes. There was some hyperpigmentation on her lips and her skin. The patient was hypotensive, tachycardiac, afebrile with hyponatremia and anemia in her laboratory testing. The intravenous fluid was started with broad-spectrum antibiotics however the patient remained hypotensive requiring vasopressors. Which of the following is the least accurate statement regarding the patient 's condition?

## Choices:

1. The patient might have autoimmune polyglandular endocrinopathy type 2
2. ACTH stimulation test is required now
3. The condition can be precipitated by pregnancy or infection
4. ACTH level is expected to be elevated

## Answer: 2 - ACTH stimulation test is required now

## Explanations:

- The patient has acute adrenal crises in the setting of type 1 diabetes presenting with hypoglycemia and seizures. Given the history of autoimmune disease and the family history of other autoimmune diseases including celiac disease and multiple sclerosis, the patient developed adrenal insufficiency which could explain the weight loss and fatigue for the past 3 weeks. ACTH stimulation test should not be done during the acute setting.
- The primary manifestations of adrenal crisis are hypotension or hypovolemic shock. Other common signs and symptoms include nausea, vomiting, abdominal pain, or flank pain. Hyponatremia, hyperkalemia, and hypoglycemia may occur. Adrenal crises can be precipitated by pregnancy, infection, trauma, surgery, medications, seizures and alcohol intoxication. Prompt recognition of this condition can impact survival.
- The mainstays of treatment are fluid resuscitation and corticosteroids. IV normal saline will correct the hypovolemia and hyponatremia. IV dextrose also may be needed to correct hypoglycemia. An increase in blood pressure would indicate the patient is responding to treatment.
- Autoimmune polyglandular endocrinopathy type 2, also called Schmidt syndrome initially described as adrenal insufficiency with Hashimoto's thyroiditis. Other endocrine glands can also be involved including the pancreas which can lead to type 1 diabetes, the parathyroid glands, and the gonads. It is important to check for other autoimmune diseases if the patient develops diabetes and have a strong family history of autoimmune diseases.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Adrenal Crisis

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## Question 242:

A 53-year-old male patient was found to have a large prolactinoma after presenting with decreased libido and bitemporal hemianopia. The patient was started on cabergoline 0.25 mg twice a week after his prolactin result came out 910 ng/mL (normal 20 ng/mL). His dose was increased last month to 0.5 mg as the response was suboptimal. This morning, the clinician gets called by the emergency department because the patient was admitted during the night after he developed sudden loss of vision in both eyes, associated with a severe headache episode. On evaluation, he is alert and oriented but has no vision bilaterally. Extraocular muscles move adequately. Both pupils are dilated and do not respond to light. He has stable vital signs. Magnetic resonance imaging shows significant tumor enlargement compared to the initial study with intratumoral hemorrhage. What is the best management in this patient?

## Choices:

1. Hydrocortisone bolus followed by emergency surgery
2. Hydrocortisone bolus and increase the cabergoline dose to 1.0 mg twice a week
3. Discontinue cabergoline use and start on hydrocortisone replacement
4. Conservative management with elective endoscopic endonasal resection

## Answer: 1 - Hydrocortisone bolus followed by emergency surgery

## Explanations:

- The patient most likely has pituitary apoplexy. Emergency surgery should be reserved for patients with progressive deterioration of consciousness, hypothalamic involvement, and progressive visual worsening.
- Immediate medical management of patients presenting with pituitary apoplexy includes a careful assessment of fluids and electrolyte balance, replacement with corticosteroids, and supportive measures to ensure hemodynamic stability. Hydrocortisone should be administered as 100–200 mg intravenous bolus.
- Postoperative visual clinical improvement is directly correlated to the surgical procedure performed as soon as possible.
- Pituitary prolactinomas are initially treated medically with cabergoline or bromocriptine even if they present with bitemporal hemianopia. A sudden visual worsening due to pituitary apoplexy will require surgical decompression.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Pituitary Apoplexy

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## Question 243:

A 30-year-old African American male, without previous history of atherosclerotic cardiovascular disease, comes to the cardiology clinic for medical checkup. He says that he has been eating junk foods lately. His past medical history and his family history is unremarkable. He is currently not on any medications. On physical examination, vitals were normal with nor remarkable findings. The cardiologist sends him for a cholesterol screening test with a Friedewald method. What is the formula for the said method?

## Choices:

1. HDL + LDL + Triglycerides( TG)/5
2. HDL + LDL + Triglycerides( TG)/3
3. HDL + Triglycerides + LDL/5
4. LDL + Triglycerides + HDL/5

## Answer: 1 - HDL + LDL + Triglycerides( TG)/5

## Explanations:

- Friedewald method is an indirect method for blood cholesterol level estimation.
- The formula is HDL + LDL + Triglycerides(TG) /5.
- Triglycerides need to be divided by five because the ratio of VLDL and TG is approximately 1:5.
- However, this is problematic in several conditions, such as when the TG level above 400 mg/dL.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Cholesterol Screening

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## Question 244: Which lab test should be ordered for a 30-year-old female with amenorrhea, hypertension, muscle weakness, abdominal striae, and weight gain?

## Choices:

1. Morning cortisol level
2. Low-dose dexamethasone suppression test
3. Adrenocorticotropic hormone level
4. Follicle stimulating hormone and luteinizing hormone

## Answer: 2 - Low-dose dexamethasone suppression test

## Explanations:

- The patient most likely has Cushing syndrome.
- The low-dose dexamethasone suppression test is used for diagnosis.
- Other tests used to make this diagnosis are urinary free cortisol level, evening serum and salivary cortisol level, and dexamethasone-corticotropin-releasing hormone test.
- MRI of the pituitary gland, unenhanced CT of the adrenals, and chest x-ray and CT also may be obtained to localize the pathology.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Cushing Syndrome

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## Question 245:

A 48-year-old man presents to the clinic presents with a chief complaint of recent excessive weight gain. His diet consists of rice, lentils, and sugary food. He has a history of diabetes and hypertension. He lives a sedentary lifestyle. Metabolic workup reveals increased IL-6, TNF-alpha, resistin, and visfatin. His BMI is 32.3 $kg/m^2$. Which of the following best describes the underlying pathophysiology of this patient's current condition?

## Choices:

1. Chronic low-grade inflammation of the adipose tissue
2. Post-inflammatory markers released by beta-cells of the pancreas
3. Excessive secretion of leptin by adipose tissue
4. Lack of insulin hormone

## Answer: 1 - Chronic low-grade inflammation of the adipose tissue

## Explanations:

- The molecular definition of obesity is chronic low-grade inflammation of adipose tissue.
- Inflammatory markers released by increasing the fat mass in adipose tissue have inhibitory effects on beta cells of the pancreas leads to insulin resistance.
- An increase in adipose tissue fat mass leads to increased secretion of resistin, which is supposed to be a connecting link between obesity and an increase in insulin resistance.
- An increase in adipose tissue mass leads to an increase in leptin secretion to decrease appetite.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Pathophysiology of Obesity

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## Question 246:

A 36-year-old female comes to your office to get a second opinion. She has not been happy with her primary care doctor, who wants her to get an MRI of her brain and see an endocrinologist due to an elevated prolactin level. She says she does not have money for the test and specialist right now. Upon further questioning, she reveals a past medical history of recently diagnosed thyroid disease for which she has started taking levothyroxine one week ago, migraine headaches, and gluten sensitivity. She has her recent laboratory results with her that reveal TSH 9, T4 0.3, T3 2.5, anti-TPO 1000, and prolactin 51. Which of the following is the most appropriate next course of action?

## Choices:

1. Urgent referral to endocrinology
2. Urgent referral to neurosurgery for evaluation
3. Repeat blood tests in 5 weeks and reassurance that hypothyroidism can cause elevated prolactin levels
4. Send the patient for MRI to rule out prolactinoma.

## Answer: 3 - Repeat blood tests in 5 weeks and reassurance that hypothyroidism can cause elevated prolactin levels

## Explanations:

- The patient has a diagnosis of Hashimoto's or autoimmune thyroiditis. Hypothyroidism is a known cause of elevated prolactin levels. It is reasonable to treat the underlying disease process and repeat the labs before proceeding with MRI.
- This patient does not need urgent referral to a surgeon.
- Prolactinomas would result in prolactin levels much higher than her current number. In addition, further workup and treatment are warranted before referral to a specialist.
- While an MRI is a reasonable option if the prolactin does not normalize with thyroid hormone treatment, it would be more reasonable to treat and repeat blood tests before sending for this expensive test.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hashimoto Thyroiditis

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## Question 247:

A 19-year-old female presents with complaints of acne on her face. She says she has embarrassing hair growth on her face, abdomen, and upper back. She has tried tweezing the chain hair regularly, but it has not helped much. The patient has a 3-year history of oligomenorrhea, obesity, and multiple cysts in both ovaries. The patient was prescribed a combined oral contraceptive six months ago to manage her symptoms. Since then, her symptoms have improved other than her excessive hair growth. Physical examination reveals excessive thick hair on the face and upper back. The genitourinary examination is normal, with no clitoromegaly. She is prescribed a drug to treat her hirsutism. Which of the following is the most likely mechanism of action of this drug?

## Choices:

1. Inhibits 17-alpha-hydroxylase enzyme
2. Inhibit 5-alpha-reductase enzyme
3. A non-steroidal competitive blocker of androgen receptors
4. Inhibits 21-hydroxylase enzyme

## Answer: 1 - Inhibits 17-alpha-hydroxylase enzyme

## Explanations:

- Several medications have been used to treat hirsutism associated with polycystic ovarian syndrome (PCOS) and hirsutism. Polycystic ovarian syndrome is characterized by elevated androgen levels, menstrual irregularities, and small cysts on ovaries.
- The most effective treatment of hirsutism in a female with a history of the polycystic ovarian syndrome that has persisted despite being on an oral contraceptive pill is spironolactone. Spironolactone acts by inhibiting the 17-alpha-hydroxylase enzyme which preventing androgen synthesis, thus reducing hirsutism.
- It involves primary defects in the hypothalamic–pituitary axis, insulin secretion and action, and ovarian function. Treatment is directed at the symptoms. Treatment goals should include correcting anovulation, inhibiting the action of androgens on target tissues, and reducing insulin resistance.
- Finasteride is a drug that inhibits the 5-alpha-reductase enzyme and is used to treat benign prostate hypertrophy and male-pattern baldness. Androgen synthesis inhibitors and androgen receptor antagonists are competitive blocker of androgen receptors.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hirsutism

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## Question 248: A 14-year-old girl with classic galactosemia (galactose-1-phosphate uridylyltransferase deficiency) diagnosed by newborn screening presents for evaluation of delayed puberty. On exam, she has Tanner I breast development and Tanner III pubic hair development. What is the most likely explanation for the timing of her pubertal development?

## Choices:

1. Constitutional delay of puberty
2. Intracranial mass resulting in hypogonadotropic hypogonadism
3. Primary ovarian insufficiency
4. Estrogen receptor defect associated with homozygous GALT gene mutation

## Answer: 3 - Primary ovarian insufficiency

## Explanations:

- Eighty percent to 100% of girls with classic galactosemia have primary ovarian insufficiency at a young age.
- It is proposed that direct toxic effects of galactose or elevated metabolites cause damage to the ovary. Although data are limited, males with galactosemia do not have impaired gonadal function, possibly because GALT mRNA levels are much lower in the testis than in the ovary.
- Nearly all adolescent girls with classic galactosemia will require hormone replacement therapy to progress through puberty and will require hormone replacement until the time of menopause. Rare cases of spontaneous pregnancy with no hormone replacement therapy have been reported.
- Girls and women with Duarte galactosemia who demonstrate about 25% of normal GALT (galactose-1-phosphate uridylyltransferase) activity have a normal ovarian function, ovarian reserve, and age of menopause

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Galactose 1 Phosphate Uridyltransferase Deficiency

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## Question 249:

A 17-year-old boy presents with complaints of intermittent burning micturition and infrequent bone pains. Urinalysis shows trace blood on his urine dip test and presence of calcium crystals. Ultrasound pelvis revealed hyperechoic foci with acoustic shadowing in the urinary bladder. Lab reports revealed a serum calcium level of 11.3 mg/dL and a serum phosphate level of 4.0 mg/dL. 24-hour urinary calcium level revealed a value of 403 mg/L. A DEXA-scan to determine the bone density was advised. What is the significance of average bone density reading in such patients compared to that of normocalciuric stone formers?

## Choices:

1. Both have same bone mineral densities
2. They are at more risk of bone fractures
3. They have better bone mineral density than their normocalciuric peers
4. They are prone to heteroplastic osteoma formation

## Answer: 2 - They are at more risk of bone fractures

## Explanations:

- Hypercalciuria is generally considered to be the most common identifiable metabolic risk factor for calcium nephrolithiasis. It also contributes to osteopenia and osteoporosis. Its significance is primarily due to these two clinical entities: nephrolithiasis and bone resorption.
- On average, hypercalciuric calcium stone formers have decreased bone mineral density than matched controls which are neither stone formers nor hypercalciuric.
- Even among kidney stone patients, those with hypercalciuria will have average bone calcium density measurements 5% to 15% lower than their normocalciuric peers.
- This can often be corrected by the addition of a thiazide based diuretic or indapamide.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hypercalciuria

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## Question 250:

A 16-year-old female presents for disproportionally distributed fat loss. She reports gradual fat loss from her face, neck, upper extremities, and truncal region and increased fat in her hips and legs. Physical examination confirms the disproportional fat distribution, and acquired partial lipodystrophy is suspected. Which of the following is the most likely laboratory finding?

## Choices:

1. Decreased serum C1 level
2. Increased serum C3 level
3. Increased serum C3NeF level
4. Decreased serum C4 level

## Answer: 3 - Increased serum C3NeF level

## Explanations:

- Acquired partial lipodystrophy is characterized by gradual fat loss from the face, neck, upper extremities, and then the truncal region. Patients most often present in adolescence, and females are affected more than males, with ratios ranging from 4:1 to 8:1.
- This condition is progressive, and postpubertal females may demonstrate compensatory fat deposition in the hips and legs. The metabolic complications seen in the other lipodystrophies do not seem to be as common in patients with acquired partial lipodystrophy. However, these patients are more susceptible to kidney disease.
- Most patients with acquired partial lipodystrophy have elevated serum C3NeF levels (nephritic factor).
- Patients usually have normal levels of C1 and C4 and decreased serum C3 levels. Although uncommon, lipid abnormalities can occur in the form of raised triglyceride levels and low high-density lipoprotein (HDL) cholesterol levels.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Lipodystrophies

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## Question 251: A 25-year-old woman presents to the clinic to discuss a possible pregnancy in the next 6 months. She denies any significant past medical history. Lab test results reveal normal blood counts, renal function, and liver enzymes. A fasting lipid panel shows LDL cholesterol 350 mg/dL and normal triglycerides. She has a family history of coronary artery disease in her mother (at age 45) and hypertension in her father. Which of the following is the most appropriate recommendation for screening her baby?

## Choices:

1. Age 3 years and older
2. After one year
3. Age 2 years and older
4. Age 9 to 11 years

## Answer: 3 - Age 2 years and older

## Explanations:

- Having only an LDL level of 330 mg/dL or more, or a mutation in the LDL receptor, ApoB-100, or the PCSK9 gene will earn a diagnosis of probable familial hypercholesterolemia (FH), based on the Dutch lipid clinic criteria.
- If a patient has any xanthomas, genetic mutation or family history of FH, premature cardiovascular events, tendinous xanthomas, and/or corneal arcus senilis, and elevated LDL levels in young ages on top of the gene mutation or the LDL level, as mentioned above, the diagnosis becomes definite FH. Screening for FH should occur in people age 2 years and older if the patient has a family history of hypercholesterolemia or premature coronary artery disease.
- Screening includes measurement of a non-fasting non-high-density lipoprotein (HDL) cholesterol or fasting lipid profile.
- Universal screening is recommended to diagnose children with FH at ages 9 to 11 years. Children with a non-fasting non-HDL cholesterol result 145 mg/dL and higher need to evaluate by fasting lipid profile.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Familial Hypercholesterolemia

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## Question 252:

A 16-year-old female is evaluated for amenorrhea of 5 months duration. Review of systems is positive for cold intolerance, dizziness, exertional dyspnea, and fatigue. Past medical history is unremarkable. She takes no medications and denies the use of alcohol, illicit drugs, or tobacco. The patient is in her first year of college and is active on the cross country and track teams; she reports stress from her coarse load and trying to lose weight in order to run faster. She is not currently sexually active. Temperature is 35.5°C (95.9°F), blood pressure is 84/52 mmHg, pulse rate is 36/min and regular, respiratory rate is 16/min, oxygen saturation is 95% on ambient air, and body mass index 16.5 kg/m2. Physical examination reveals a cachectic female in no acute distress with a yellow skin hue. There is fine hair over her posterior neck. Heart rate is slow without murmurs or skipped beats. Lungs are clear to auscultation. The abdomen is scaphoid and nontender. The pelvic exam is unremarkable. Electrocardiogram reveals sinus bradycardia. Urine beta-hCG is negative. Which one of the following endocrine abnormalities are commonly associated with the most likely diagnosis?

## Choices:

1. Hypothyroidism
2. Hypergonadotropic hypogonadism
3. Hypogonadotropic hypogonadism
4. Precocious puberty

## Answer: 3 - Hypogonadotropic hypogonadism

## Explanations:

- Hypothyroidism may result in prolonged anorexia nervosa due to hypothalamic dysfunction. However, it is less common than hypogonadotropic hypogonadism.
- Hypergonadotropic-hypogonadism is seen in patients with Turner syndrome. This is because the ovaries are not working, and the pituitary gland releases excess gonadotropins without negative feedback from estrogen.
- Anorexia nervosa results in failure of the hypothalamic-pituitary-gonadal axis. This results in hypogonadotropic hypogonadism.
- Precocious puberty is not common in anorexia nervosa; in fact, patients may have delayed puberty due to a lack of gonadotropins.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Anorexia Nervosa

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## Question 253: A 24-year-old woman presents to the clinic for fatigue. Except for a childhood history of an appendectomy at age 12, she does not have a history of any medical illnesses. She states that her family has been in good health, although a couple of relatives (mother and maternal grandmother) are being “watched” for high blood sugars. She appears healthy, has normal vital signs with a BMI of 23 kg/m2, and no significant findings on physical exam. Her fasting blood sugar is 115 mg/dL. What is the most likely diagnosis?

## Choices:

1. Type 1 diabetes
2. Type 2 diabetes
3. Impaired fasting glucose
4. Maturity onset diabetes in the young (MODY)

## Answer: 3 - Impaired fasting glucose

## Explanations:

- Although the patient's strong family history of hyperglycemia and lack of obesity could be suggestive of MODY, insulin resistance and fasting impaired diabetes are much more common causes of hyperglycemia.
- The patient does not have diabetes because her fasting blood sugar, although elevated, does not meet the criteria for a diagnosis of diabetes (126 m/dL or greater).
- Blood glucose should be monitored more regularly, and if there is a progression in the levels, more aggressive treatment with medications should be pursued on top of lifestyle modifications.
- MODY accounts for only 2-6% of the patients who have been diagnosed with type 2 diabetes.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Maturity Onset Diabetes in the Young

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## Question 254: A 55-year-old male patient comes to the hospital due to chronic headaches. He has used over the counter medication for his headache, but no improvement. This headache is present for the last 7 months. It increases when the patient leans forwards. He also hs some visual problems, in his lateral visual field unilaterally. He also said that he has not had sexual intercourse with his wife in the last 4 months. Imaging of the brain shows a pituitary tumor. His blood report shows a low level of testosterone, follicular stimulating hormone, and luteinizing hormone. But the prolactin level is elevated. Besides surgical correction, an oral agent is prescribed for his decreased desire for sexual intercourse. Before starting this agent, which of the following should be done?

## Choices:

1. Serum electrolytes
2. Serum lipid profile
3. Ultrasonogram of abdomen
4. Doplar study of the scrotum

## Answer: 2 - Serum lipid profile

## Explanations:

- A pituitary tumor can cause hypogonadotropic hypogonadism.
- Testosterone analog may be used for this condition for symptomatic improvement.
- These agents can cause hepatic impairment, polycythemia, hypercholesterolemia.
- So, before starting these agents, lipid profile, hepatic function tests, hemoglobin, and hematocrit level should be checked.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Anabolic Steroids

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## Question 255:

A 28-year-old male presents to his primary care provider office. He has been trying to conceive unsuccessfully for the past two years. He reports that, as a part of a thorough couple testing, he had a genetic analysis that revealed his karyotype is XYY with 47 chromosomes. He is very anxious to understand what this means for his fertility. He has no other complaints at the moment. His physical examination is benign, with no gynecomastia or testicular pathologies. His routine laboratory tests are within normal limits. The patient is scheduled for more fertility testings in 2 weeks, but he asks about the usual course of his condition. Which of the following is an appropriate answer to the patient's concerns about his ability to have children?

## Choices:

1. He will not be able to father children naturally due to azoospermia
2. He will be able to father children, but their children will invariably have this condition as well
3. He will often be able to father healthy children naturally, but assistive reproductive technologies might be needed due to oligospermia
4. He will not be able to father children naturally due to abnormally low testosterone levels

## Answer: 3 - He will often be able to father healthy children naturally, but assistive reproductive technologies might be needed due to oligospermia

## Explanations:

- Jacob's Syndrome, also known as 47, XYY Syndrome, is a rare genetic condition that occurs in about 1 out of 1000 male children. The median age of diagnosis is approximately 17 years, with many patients reporting due to infertility concerns.
- Many men with this disease are fertile despite the increased risk of sperm abnormalities. There is a possibility that these men may be diagnosed with infertility due to oligospermia or other sperm abnormalities.
- Men with Jacob's Syndrome who are trying to conceive may benefit from an early sperm analysis to screen for low sperm counts or sperm abnormalities. Patients should be informed that many men with this condition are able to father children, and that reproductive technology may be of assistance if difficulties do arise.
- Patients who are having difficulty achieving pregnancy due to low sperm counts may need to undergo in-vitro fertilization or intracytoplasmic sperm injection. Men with infertility should receive a comprehensive evaluation from a qualified reproductive endocrinologist.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Jacobs Syndrome

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## Question 256:

A 35-year-old woman, gravida 2 para 2, presents with complaints of fatigue, mood changes, and constipation for the past 1 month. She hasn't had menses since she gave birth 7 months ago. Her last delivery was uncomplicated except for tachycardia and anxiety which resolved within 2 weeks. Her past medical history includes lactose intolerance and DM type 1. Her mother has Graves disease and her paternal grandmother died from myxedema coma. The physical exam reveals pallor and cracked dry skin. Neck examination reveals no tenderness but a mild goiter. Laboratory values demonstrate TSH 9.1 mU/L and T4 3.9 µg/dL. What is the next best step in management?

## Choices:

1. Send blood samples for thyroid peroxidase (TPO), ESR and ANA
2. Ultrasound of the thyroid gland
3. Start low dose levothyroxine on the basis of TSH and T4
4. Reassurance that it is self-limiting

## Answer: 1 - Send blood samples for thyroid peroxidase (TPO), ESR and ANA

## Explanations:

- Postpartum thyroiditis (PPT) is a destructive autoimmune condition occurring in the first year after delivery in women without a history of thyroid disease prior to pregnancy. Postpartum thyroiditis is an autoimmune disease and associated with the presence of antibodies to thyroid peroxidase (TPO). If a pregnant woman is positive for TPO antibodies early in pregnancy, her chances of developing postpartum thyroiditis are 30–52%. It typically has a hyperthyroid phase as indicated by anxiety and tachycardia followed by an euthyroid state then finally coming to a hypothyroid condition demonstrated by fatigue, constipation and mood changes.
- ESR may be elevated. ANA is typically can be positive but is non-specific. Both these labs should be sent for assessment. TSH is elevated with low total T4 and T3. In endocrinology usually, biochemical confirmation is then followed by a radiological investigation.
- Postpartum thyroiditis may also occur after the loss of a pregnancy at 5–20-week gestation. TPO-Ab titer naturally decreases during pregnancy secondary to the immunosuppressed state. For those who remain TPO-Ab positive in the third trimester, 80% will develop postpartum thyroiditis.
- Ultrasound typically reveals a hypoechoic region and decreased vascularity. It is generally a self-limiting condition. Some cases require levothyroxine but after biochemical confirmation. Fine needle aspiration is done in cases where the diagnosis is uncertain. It is typically not needed.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Postpartum Thyroiditis

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 257:

A 55-year-old man is found to have elevated calcium levels on routine lab workup. He has no symptoms, and past medical history is insignificant. Vital signs are pulse rate 75/min, blood pressure 122/78 mm Hg, respiratory rate 17/min, and temperature 98.6 F (37 C). Physical examination is unremarkable. Lab workup shows calcium of 11.0 mg/dL (8.6-10.3), albumin 4.0 g/dL, parathyroid hormone (PTH) 125 pg/mL (15-65), and creatinine 0.9 mg/dL (0.8-1.1). Urine calcium excretion is 311 mg/24 hours. His dual-energy x-ray absorptiometry has the following T scores: lumbar spine T -0.6, hip T -1.5, distal one-third of the radius T -1.3. What is the next step in the management of this patient?

## Choices:

1. Intravenous fluid
2. Surgery
3. Loop diuretics
4. Bisphosphonates

## Answer: 4 - Bisphosphonates

## Explanations:

- Primary hyperparathyroidism is a relatively common disorder that may cause significant renal and skeletal complications. However, conservative observation or medical therapy may be appropriate for selected patients.
- Some patients who are not surgical candidates may benefit from medical management of primary hyperparathyroidism. Bisphosphonates can increase bone mineral density in those with osteoporosis or osteopenia.
- The bisphosphonates act on osteoclasts cells in the bone and inhibit bone resorption. This results in decreasing serum calcium levels.
- These patients need continuous monitoring. If there is worsening hypercalcemia or the development of complications, then surgery should be recommended. The current guidelines state that surgery should be recommended for asymptomatic primary hyperparathyroidism when the serum calcium is more than 1 mg/dL greater than the upper limit of normal, age younger than 50 years, osteoporosis, GFR less than 60 mL/min, urine calcium greater than 400 mg/24 hours, or evidence of renal calcification or stones.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Primary Hyperparathyroidism

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 258:

A 52-year-old man presents for his regular check-up. He has a past medical history of hypertension and hyperlipidemia. His medications include aspirin, metoprolol succinate, and atorvastatin. All his vital signs are within normal limits. There are no abnormalities on examination. Blood tests show triglycerides 380 mg/dL (50-150) and low-density lipoprotein (LDL) 102 mg/dL (85-125). Which of the following is the most appropriate next step in the management of this patient?

## Choices:

1. Add fenofibrate
2. Stop atorvastatin and start gemfibrozil
3. Add gemfibrozil
4. Add niacin

## Answer: 1 - Add fenofibrate

## Explanations:

- The patient is already on a statin, and his triglycerides are still elevated, so he will need another medication to control the triglycerides.
- In the setting of concomitant statin use, fenofibrate is the preferred fibrate as gemfibrozil is associated with a higher risk of myositis.
- Due to protein binding, fenofibrate has an interaction with warfarin and requires close monitoring.
- Fibrates decrease VLDL production, increase catabolism of TGRL through increased fatty acid oxidation, increased LpL synthesis, and reduced ApoC-III. Another option is eicosapentaenoic acid (EPA), but there are conflicting studies about the reduction of cardiovascular risk.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hypertriglyceridemia

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## Question 259:

A 68-year-old woman with a past medical history of uncontrolled type 2 diabetes mellitus presents to the clinic for a follow-up visit. She is currently taking metformin, glimepiride, and sitagliptin. Her vital signs are within normal limits. Physical exam reveals decreased pinprick sensation of both feet but is otherwise normal. Her HbA1c is 9.4%. When discussing medication options, she states she is afraid of needles and will not use any injectable medication. Which of the following is the best initial therapy for this patient?

## Choices:

1. Exenatide
2. Semaglutide
3. Dulaglutide
4. Liraglutide

## Answer: 2 - Semaglutide

## Explanations:

- An oral formulation of semaglutide was approved by the FDA in 2019. It is available in 3 mg, 7 mg, and 14 mg doses.
- Exenatide is a subcutaneous injection, given either twice daily, or its extended-release formulation is once weekly.
- Dulaglutide is a once-weekly injection.
- Liraglutide is a once-daily injection.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Compare And Contrast the Glucagon-like Peptide-1 Receptor Agonists (GLP1RAs)

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 260: What disorder is often associated with individuals who have celiac disease?

## Choices:

1. Addison disease
2. Type 1 diabetes
3. Conn Syndrome
4. Cushing syndrome

## Answer: 2 - Type 1 diabetes

## Explanations:

- There is a strong association between celiac disease and type 1 diabetes.
- Some individuals with type 1 diabetes will also develop celiac disease.
- A gluten free diet does not affect the established diabetes.
- People with one autoimmune disorder often tend to have other autoimmune disorders. Besides type 1 diabetes, some patients with celiac disease also develop graves disease.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Celiac Disease

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 261: An 80-year-old female is transferred to the emergency department via ambulance after being found unresponsive with a blood glucose of 56 mg/dL this morning. She has a history of type 2 diabetes mellitus and is on insulin pump therapy. She received a bag of D50 in the ambulance. The patient was responsive by the time she was seen, and she was able to give a history. She reports that her last hemoglobin A1c was 8.0%, which was obtained at the office of her endocrinologist previous week. During the physical exam, you find that her infusion site is still intact, and her pump is disconnected. The patient asks the clinician what to do about her infusion site. How should the clinician respond?

## Choices:

1. Rotation of sites is not necessary at this time
2. Change needle and location or set in five days
3. No need to change site if redness occurs at needle location
4. Change needle and site or set in 48 to 72 hours

## Answer: 1 - Rotation of sites is not necessary at this time

## Explanations:

- Injection sites or needle locations need to be changed every 48 to 72 hours.
- Never leave a needle in if the site becomes red, inflamed, swollen, or painful. Remove and change the needle and set up, changing the location to another part of the body not close to the affected area.
- Call the provider and seek attention immediately if a site becomes red, swollen, painful, or blood sugar fluctuations are occurring, making glycemic control difficult.
- Remember, the first sign of an infection in a person with diabetes mellitus can be an inability to control blood sugar levels with frequent fluctuations.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Insulin Pump

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 262:

A 56-year-old female presents to the emergency department due to sudden-onset severe epigastric pain, nausea and intractable vomiting, and restlessness for the past 14 hours. The pain is constant, radiating to the back, and associated with abdominal tenderness. Medical history is notable for recently diagnosed type 2 diabetes mellitus for 6 months, which has been well-controlled on an oral hypoglycemic agent (OHA). She has a remote 5 pack-year-smoking history but she does not consume alcohol. Her temperature is 38 C (100.4 F), blood pressure is 105/70 mm Hg, pulse is 114/min, and respirations are 21/min. Laboratory results are significant for serum lipase and amylase to be 510 U/L and 477 U/L, respectively. Lipid profile and liver-function-tests are within-normal-limits. Abdominal ultrasound shows a diffusely enlarged and hypoechoic pancreas, without any evidence of gallstones. Which of the following OHA is most-likely associated with the patient's presentation?

## Choices:

1. Linagliptin
2. Metformin
3. Glyburide
4. Canagliflozin

## Answer: 1 - Linagliptin

## Explanations:

- Linagliptin belongs to the group of oral hypoglycemic agents, called Dipeptidyl peptidase-4 (DPP-4) inhibitors. These deactivate glucose-dependent insulinotropic polypeptide (GIP) and glucagon-like peptide 1 (GLP-1), among others. Therefore, these influence glucose control through multiple effects, such as via decreasing glucagon release and increasing glucose-dependent insulin release, decreasing gastric emptying, and increasing satiety.
- The most commonly reported side effects of linagliptin are upper respiratory and urinary tract infections, nasopharyngitis, and headache. However, a rare but serious side effect associated with linagliptin is acute pancreatitis.
- If acute pancreatitis is suspected in a patient taking DPP-4 inhibitors, these should be discontinued and should not be restarted if pancreatitis is confirmed. In addition, those with a history of pancreatitis should not be initiated on these. Therefore, those taking DPP-4 inhibitors should undergo regular monitoring and reporting of pancreatic problems.
- Heart failure and edema are not associated with DPP-4 inhibitors, but with thiazolidinediones. Arrhythmia and ischemic stroke are not directly-reported adverse effects of any oral hypoglycemic medication.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Oral Hypoglycemic Medications

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 263:

A 65-year-old male presents with confusion and anuria. His past medical history is significant for hypertension, hyperlipidemia, insomnia, and diabetes mellitus with peripheral neuropathy. The patient is awake and oriented to person only. On examination, his blood pressure is 110/80 mmHg, pulse 90/min, respiratory rate is 18/min, and oxygen saturation 98%. Physical examination is normal except for suprapubic fullness. On catheterization, 800 mL of urine is drained. Which of the following drugs is most likely the cause of this patient's condition?

## Choices:

1. Metformin
2. Duloxetine
3. Amitriptyline
4. Simvastatin

## Answer: 3 - Amitriptyline

## Explanations:

- Amitriptyline indications are depression, anxiety, post-traumatic stress disorder, insomnia, chronic pain (diabetic neuropathy, fibromyalgia). It is in the tricyclic antidepressant (TCA) drug classification and acts by blocking serotonin and norepinephrine reuptake. The three-ring central structure, along with a side chain, is the basic structure of tricyclic antidepressants. Amitriptyline is a tertiary amine and has strong affinities for alpha-adrenergic, histamine (H1), and muscarinic (M1) receptors. It is more sedating and has increased anticholinergic properties compared to other TCAs.
- The most commonly encountered side effects of amitriptyline include urinary retention, weight gain, gastrointestinal (GI) symptoms like constipation, xerostomia, dizziness, headache, and somnolence.
- It can also cause heart rate variability, slow intracardiac conduction, induce various arrhythmias, and cause QTc (corrected QT) prolongation.
- Metformin is an antidiabetic medication used to treat diabetes mellitus type 2. It is not known to cause urinary retention. Simvastatin is a lipid-lowering drug and is not known to cause anticholinergic side effects. Duloxetine is a selective serotonin and norepinephrine reuptake inhibitor antidepressant and is used to treat diabetic neuropathy and stress urinary incontinence (off-label use). Common side effects include GI disturbance, headache, and rhabdomyolysis.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Amitriptyline

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## Question 264:

An 8-year-old male patient presents to the hospital with seizures. For the past year, he was having trouble in school due to behavioral problems and learning difficulties. His teacher noted a regression in his handwriting and he was often caught being inattentive in class. He lost weight in the past months and complains of constant fatigue. His mother also noted increased pigmentation in the nape and axillary areas. The levels of very-long-chain fatty acids are elevated. What is the most likely diagnosis?

## Choices:

1. Canavan disease
2. Krabbe disease
3. Adrenoleukodystrophy
4. Ataxia telangiectasia

## Answer: 3 - Adrenoleukodystrophy

## Explanations:

- Adrenoleukodystrophy results in progressive loss of myelin and adrenal insufficiency.
- The X-linked form presents earliest and has the most rapid course.
- A deficiency of lignoceroyl-CoA likely contributes to the inability to metabolize long chain fatty acids though the actual pathogenesis of the various forms of adrenoleukodystrophy is not well described.
- The adult form is a slowly progressive disease and mostly involves peripheral nerves and the adrenal gland.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Adrenoleukodystrophy

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## Question 265:

A 65-year-old man comes to the emergency department with complaints of confusion, nausea, and abdominal pain. Vitals include a temperature of 37 C (98.6F), heart rate 80 bpm, respiratory rate 18/min, blood pressure 160/90 mmHg, and saturations are 98% on room air. His physical exam shows dry mucous membranes. He is alert, oriented to self and time but not place. The abdomen is tender without any signs of rigidity, guarding or rebound. His past medical history includes osteoporosis, hypertension, and diabetes mellitus. His medications include vitamin D and calcium, metformin, and amlodipine. His labs show creatinine of 1.2 mg /dl, serum calcium 12 mg/dL. What is the next step in management?

## Choices:

1. Intravenous calcitonin
2. Intravenous bisphosphonates
3. Intravenous hydration with glucocorticoids.
4. Intravenous hydration with isotonic saline

## Answer: 4 - Intravenous hydration with isotonic saline

## Explanations:

- The initial treatment of vitamin D toxicity is stopping all vitamin D and calcium supplements and starting on isotonic saline at least a rate of 200-250 cc/hr to match the urine output of 150cc/hr.
- The mild elevation in creatinine is a combination of both dehydration from vomiting and the effects of hypercalcemia. The only way a person may get vitamin D toxicity is by ingestion of extremely high doses of vitamin D for a prolonged period.
- Most cases resolve with conservative management. It is recommended that the level of the circulating form of vitamin D (25-hydroxyvitamin D) is checked at least twice a year.
- The use of glucocorticoids is controversial due to various side effects of high doses of steroids. It is used sometimes if hypercalcemia is related to granulomatous diseases. In severe refractory hypercalcemia with serum calcium > 14 mg/dL, IV calcitonin and bisphosphonates can be used.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Vitamin D Toxicity

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## Question 266: A 52-year-old woman with refractory-to-treatment secondary hyperparathyroidism due to end-stage renal disease on hemodialysis for uncontrolled diabetic nephropathy and a history of hypertension is being prepared for parathyroidectomy. Which of the following factors would increase the patient's risk for hungry bone syndrome the most?

## Choices:

1. Low parathyroid hormone, normal BMI, low number of osteoclasts on bone biopsy
2. Hypercalcemia, elevated PTH, low blood urea nitrogen
3. Hypocalcemia, evidence of brown tumors on x-ray of the femur, elevated PTH
4. Low alkaline phosphatase, low blood urea nitrogen, higher lumbar spine bone mineral density

## Answer: 3 - Hypocalcemia, evidence of brown tumors on x-ray of the femur, elevated PTH

## Explanations:

- Preoperative lower than normal calcium levels increase the risk for post parathyroidectomy hungry bone syndrome (HBS) in the setting of secondary hyperparathyroidism. Low calcium levels in secondary hyperparathyroidism are the opposite of the high calcium levels portending an increased risk for HBS in primary hyperparathyroidism. Still, both situations show underlying increased parathyroid activity.
- Low calcium states further worsen secondary hyperparathyroidism, raising parathyroid hormone levels further, increasing stimulation for a shift towards net bone resorption that will worsen the rebound bone formation that occurs once parathyroid hormone stimulation is removed.
- Radiologic evidence of bone diseases, such as brown tumors, fractures, and osteitis fibrosa cystica are seen with increased risk for HBS.
- Recall that the factors that increase the risk for HBS include: high parathyroid hormone levels, high BMI, high alkaline phosphatase levels, high numbers of osteoclasts on bone biopsy, high blood urea nitrogen, low lumbar spine bone mineral density (post thyroidectomy).

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hungry Bone Syndrome

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## Question 267:

A 65-year-old female comes for a followup visit. She was diagnosed with painless goiter six months ago. It progressively increased in size over the past few years, but she has been asymptomatic. She reports no dyspnea, fatigue, malaise, or hoarseness, but she clears her throat more often as she feels that solid food gets stuck sometimes. A fine-needle aspiration (FNA) biopsy three years ago revealed fibrous tissues. Thyroid studies have been within normal limits. On physical exam, vital signs are stable. The patient's anterior neck findings are significant for a stiff, enlarged goiter, more prominent in the left lobe that appears stable since the last visit. Which of the following is the most appropriate management?

## Choices:

1. Glucocorticoids
2. Surgery
3. Radiation
4. Observe

## Answer: 1 - Glucocorticoids

## Explanations:

- Glucocorticoids are the mainstay of medical treatment. The anti-inflammatory effects of glucocorticoids are most effective when used early in the disease process. Response to the treatment is variable, with some cases showing dramatic improvement with a reversal of dysphonia and upper airway symptoms, while others showed a complete lack of response.
- Surgery is indicated only to relieve compressive symptoms. As this patient has mild compressive symptoms, she may benefit from a course of medical therapy before surgical intervention.
- No response to the glucocorticoids could be due to the increase in fibrosis seen in late disease as compared with early disease, where inflammation is prominent.
- In this patient who is now becoming symptomatic with compressive symptoms, continuing to observe is inappropriate. She will benefit from a trial of glucocorticoids, tamoxifen, or mycophenolate mofetil to help decrease the thyroid enlargement.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Riedel Thyroiditis

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## Question 268: A 66-year-old smoker presented to the clinic with a complaint of progressive shortness of breath, hemoptysis off and on associated with moon facies and dark discoloration of the abdomen. The patient also complained of having malaise and weight loss. On examination, the patient had grade 3 clubbing with the absence of breath sounds on the left base and abdominal striae. On investigation, the patient had slightly decreased Hb with elevated total leukocyte count, hypercalcemia, and deranged liver function tests. On CT-scan patient had a hilar locally infiltrating mass with paratracheal lymphadenopathy, mediastinal widening, and a left-sided effusion. On endobronchial brushing, cellular atypia was evident, and the management plan was initiated. Which biochemical marker would be advised for evaluation of his secondary symptoms?

## Choices:

1. Serum Serotonin(5-HT)
2. Serum IgE levels
3. Serum vanillylmandelic acid(VMA) levels
4. Serum ACTH levels

## Answer: 4 - Serum ACTH levels

## Explanations:

- The clinical presentation is consistent with paraneoplastic syndrome associated with primary bronchogenic carcinoma causing cushingoid features.ACTH Secretionstimulates the conversion of cholesterol to pregnenolone.
- ACTH stimulates the conversion of cholesterol to pregnenolone, which in turn transforms into pregnenolone.
- ACTH secretion is most commonly associated with small cell Ca lung, which has a hilar distribution and a vigorous course.
- Other forms of paraneoplastic syndromes also associated with small cell variety of Bronchogenic carcinoma is Syndrome of Inappropriate ADH secretion.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Paraneoplastic Syndromes

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## Question 269: A 75-year-old man with a history of ischemic heart disease and type 2 diabetes mellitus is prescribed repaglinide. The patient also takes clopidogrel. Which of the following complications is most likely to occur in this patient?

## Choices:

1. Hypoglycemia
2. Hyperglycemia
3. Hypotension
4. Hypertension

## Answer: 1 - Hypoglycemia

## Explanations:

- Clopidogrel slows down the metabolism of repaglinide, causing potentiation of the latter's effects. This results in hypoglycemia.
- Repaglinide is an oral antihyperglycemic drug used in an adult patient with type 2 diabetes mellitus.
- Oral administration.Dose range 0.5 - 4 mg before a meal. Not to exceed 16 mg /day.
- Adequate control of diabetes may also reduce the risk of a heart attack or stroke.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Repaglinide

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## Question 270: A 65-year-old woman presents with epigastric abdominal pain, nausea, and vomiting. The pain is sharp and radiates to her back. The patient has no past medical history. Her laboratory evaluation shows an elevated lipase. Which of the following medications likely contributed to her condition?

## Choices:

1. Glipizide
2. Pioglitazone
3. Sitagliptin
4. Exenatide

## Answer: 4 - Exenatide

## Explanations:

- There are reports of acute, severe pancreatitis caused by exenatide, a glucagon-like peptide-1 receptor agonist used in the treatment of type 2 diabetes mellitus.
- The underlying mechanism remains unknown, and the incidence remains low.
- Exenatide should be discontinued if a patient develops acute pancreatitis and should not be rechallenged.
- Other medications associated with acute pancreatitis include 6-mercaptopurine, aminosalicylates, sulfonamides, valproic acid, didanosine, pentamidine, tetracycline, azathioprine, estrogens, and steroids.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Acute Pancreatitis

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## Question 271:

A 35-year-old woman with a history of hypothyroidism and diabetes mellitus type 1 complains of tingling and numbness in her lower limbs that started three months ago. She also complains of fatigue and constipation. She used to exercise five days a week but recently stopped due to fatigue and lower limb numbness. She denies headaches, menstrual irregularities, visual changes, back pain, or any abdominal symptoms. Her mother has hypothyroidism and autoimmune pancreatitis. Home medications include levothyroxine, insulin glargine at bedtime, insulin lispro before meals, and an oral contraceptive. She reports taking her medications regularly. On examination, there is decreased vibratory sense and proprioception in her lower limbs bilaterally. Her ankle reflex is absent. Pain and temperature sensation is intact bilaterally. Romberg sign is positive. Laboratory tests reveal a hemoglobin of 8.8 g/dL, hematocrit of 23%, white blood cell count of 3,700/mm3, platelet count of 280,000/mm3, mean corpuscular volume (MCV) of 117 fL (normal: 80-100 fL), and thyroid-stimulating hormone of 2.7 micro IU/mL. Serum hemoglobin A1C is 7.2%. Serum vitamin B12 level is low normal. Serum folic acid level is within normal limits. Intrinsic factor antibody testing is negative. What is the most appropriate next step in the management of this patient?

## Choices:

1. Increase insulin glargine dose
2. Increase insulin glargine and insulin lispro dose
3. Transfuse 1 unit of packed red blood cells
4. Start intramuscular vitamin B12 injections

## Answer: 4 - Start intramuscular vitamin B12 injections

## Explanations:

- Hashimoto thyroiditis and diabetes mellitus predisposes this patient to other autoimmune conditions such as pernicious anemia. Her clinical presentation and symptoms are classic for vitamin B12 deficiency with a macrocytic anemia and loss of vibratory sensation and proprioception in the lower extremities.
- Serum vitamin B12 assay is not accurate in patients with intrinsic factor (IF) autoantibodies and will give false-negative results. Spuriously low serum vitamin B12 levels can also occur in patients with multiple myeloma, HIV infection, pregnancy, and oral contraceptive use. With her classic presentation, a normal vitamin B12 level is likely falsely low and should warrant further testing. Serum methylmalonic acid level should be obtained in this patient.
- It is also essential to remember that not all patients with pernicious anemia have IF antibodies. Serum IF antibody testing is highly specific but not very sensitive. Negative IF antibody titer can be seen in patients with autoantibodies to parietal cells. In patients with high suspicion for pernicious anemia and negative IF antibody assay, treatment with intramuscular vitamin B12 level is warranted. Although an assay exists for anti-parietal cell antibodies, it is not reliable and not recommended. A positive response to treatment confirms the diagnosis in these patients.
- The elevated hemoglobin A1C may be a spurious result due to patients underlying anemia. Her hemoglobin A1c should be retested once anemia is corrected before making any changes to her diabetes regimen. Moreover, her clinical examination is consistent with vitamin B12 deficiency-associated myeloneuropathy as opposed to peripheral neuropathy of diabetes.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Megaloblastic Anemia

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## Question 272: A 72-year-old man visits for a scheduled review of his type 2 diabetes mellitus. He is currently taking metformin 1 g once daily, sitagliptin 100 mg once daily, and repaglinide 1 mg pre-prandially. His clinician decides to remove repaglinide from his regimen. Which of the following is the most likely indicator to have guided this decision?

## Choices:

1. The gentleman is experiencing waking sluggishness and sweating
2. The gentleman has been experiencing bouts of gastrointestinal discomfort
3. The gentleman has been experiencing unintentional weight loss
4. The gentleman is experiencing excessive sluggishness and sweating after meals

## Answer: 4 - The gentleman is experiencing excessive sluggishness and sweating after meals

## Explanations:

- It would be wise to remove repaglinide from this gentleman's regimen if he is experiencing post-prandial symptoms of hypoglycemia.
- Postprandial hypoglycemia often occurs when insulin levels are excessive to those needed to manage the rise in blood glucose levels after eating. As Repaglinide is a short-acting insulin secretagogue, removing this will likely balance out the gentleman's insulin-to-glucose levels, preventing the bouts of hypoglycemia he is experiencing.
- While not as extreme as sulphonylureas, meglitinides such as repaglinide are associated with hypoglycemia, particularly when used in conjunction with other antihyperglycemic agents. In particular, the effect is noted shortly after the administration of repaglinide, due to its short onset time and duration of action.
- Morning sluggishness would be associated with more generalized hypoglycemia. It would be worth reviewing the whole regimen in this instance. Both gastrointestinal discomfort and weight loss are more readily associated with metformin and sitagliptin.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Repaglinide

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## Question 273:

A 19-year-old woman presents to the clinic at 13 weeks of pregnancy. She recently took a home urinary pregnancy test, which came out to be positive and does not remember the last date of her menstrual period. The patient is homeless and has no insurance. Her quantitative blood hCG levels are high. Vaginal ultrasound reveals an intrauterine twelve-week pregnancy. The patient reveals that she has taken a phenylalanine-restricted diet throughout her life due to a metabolic disorder, but ever since moving out of her parents' place, she just eats whatever she desires. Which of the following complications is most likely to occur in the developing fetus?

## Choices:

1. Aplasia cutis congenita
2. Congenital heart disease
3. Preterm birth
4. Congenital goiter

## Answer: 2 - Congenital heart disease

## Explanations:

- The Intrauterine environment is relatively high in phenylalanine (Phe), so mothers with PKU must be vigilant to maintain a very low intake. High levels of intrauterine phenylalanine lead to a number of congenital anomalies in the fetus, including cardiac defects.
- Other findings in infants born to mothers with phenylketonuria include microcephaly, intellectual disability, and growth retardation.
- During pregnancy, an expectant mother with PKU should have close monitoring of her blood Phe levels and fetal development. Blood Phe levels before and during pregnancy are typically targeted to 2 to 6 mg/dL.
- PKU is not considered a contraindication to pregnancy, but appropriate planning and monitoring are recommended.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Phenylketonuria

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## Question 274:

A 32-year-old woman with a past medical history significant only for borderline personality disorder and depression is brought to the hospital with a suspected overdose. She had a break up with her boyfriend recently. The friend accompanying the patient has type 2 diabetes and believes the patient overdosed on his oral medication, a reversible inhibitor of pancreatic alpha-amylase. The patient is complaining of flatulence and an upset stomach. Her vital signs are within normal limits. What is the most appropriate treatment strategy for this patient?

## Choices:

1. Carbohydrate-rich diet for 4 to 6 hours
2. Intensive care monitoring and management of likely prolonged hypoglycemia
3. Supportive inpatient management
4. Oral activated charcoal

## Answer: 3 - Supportive inpatient management

## Explanations:

- The patient likely overdosed on acarbose.
- Overdose with acarbose will not cause hypoglycemia but may increase gastrointestinal adverse effects. If an overdose occurs, patients should not have food or beverages that contain carbohydrates for 4 to 6 hours.
- If a patient experiences hypoglycemia while taking acarbose in combination with other anti-diabetic medications, the patient should receive instructions to use glucose (gel, tablets, etc.) as acarbose will prevent the breakdown of sucrose (table sugar) and delay glucose absorption.
- If the patient develops hypoglycemia while taking this medication, one should consider the possibility that another medication may have been taken and is the cause of hypoglycemia.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Acarbose

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## Question 275:

A 32-year-old female comes for a consult because she has been having nausea, vomiting, metallic taste, toothaches, gum pain, headache and increased salivation for 1-week. On physical examination, she has coryza, irritation, and swelling of the eyes, and productive cough with pulmonary edema. She has a history of granulomatosis with polyangiitis treated with prednisolone and potassium iodide for the skin lesions for 3 months. Which is the possible cause of these new symptoms?

## Choices:

1. New Infection
2. The complication of the granulomatosis with polyangiitis
3. Iodide toxicity
4. A side effect of prednisolone

## Answer: 3 - Iodide toxicity

## Explanations:

- The patient presents a syndrome of iodide toxicity, called Idoism, which is characterized by soreness of the teeth and gums, and severe headache, conjunctival hyperemia, lacrimation, blurred vision, rhinorrhea, and sialorrhea.
- Idoism is an uncommon effect of the potassium iodide but may occur when high doses are administered it, especially for the treatment of infectious skin disorders.
- Signs and symptoms of generally subside within a few days of discontinuing the potassium iodide; symptomatic and supportive therapy and methods to enhance the renal excretion of iodide may be necessary.
- The other choices do not present adverse effect as describe it in this patient.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Potassium Iodide

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## Question 276:

A 66-year-old woman presents to the clinic with complaints of episodic flushing of her cheeks, associated with diarrhea. This has been happening for the past 6 months and is worsening lately. She also noticed that her appetite has gone down, and she lost 30 pounds (13.6 kg) in the past 2 months. She experiences occasional suboccipital headaches associated with nausea and vomiting for which she uses over-the-counter painkillers. For the past 1 month, she has been feeling more fatigued and also noticed that her shoes feel tighter even though she is losing weight. Her past medical history is significant for type 2 diabetes mellitus for which she uses glipizide. She smoked 1 pack of cigarettes every day for 5 years and her late 20s. Her mother died of breast cancer, and her father died of coronary artery disease. On examination, heart rate is 90/min regular, and her blood pressure is 130/80 mmHg. No skin rash is noted. Bilateral lower extremity swelling is present, extending up to her ankles. Normal vesicular breath sounds are heard bilaterally on chest auscultation. Cardiac auscultation is significant for diastolic murmur in the left parasternal area. What is the next best step in the management of this patient?

## Choices:

1. Transthoracic echocardiography
2. CT abdomen
3. Blood cultures and IV antibiotics
4. Bilateral lower extremity ultrasound

## Answer: 2 - CT abdomen

## Explanations:

- Neuroendocrine cells are found in various organs throughout the body. There are several hormones which B neuroendocrine cells which include cortisol, histamine, and serotonin. Carcinoid tumors consist of abnormal growth of neuroendocrine cells results and episodic release of these hormones into the bloodstream. This results in symptoms like episodic skin flushing, diarrhea, abdominal pain, nausea, and vomiting.
- Carcinoid tumors can cause irregular thickening of the lining of the valves resulting in leaky heart valves. Carcinoid tumors are often mentioned in the etiology of pulmonic regurgitation.
- CT scan of the abdomen should be considered to rule out carcinoid tumors in patients presenting with the symptoms mentioned above and signs.
- Commoner sites of carcinoid tumors include the gastrointestinal tract and lungs. Transthoracic echocardiography helps in delineating valvular lesions. But the underlying carcinoid tumor needs to be identified for specific treatment. Blood cultures and antibiotics are indicated immediately if there is a suspicion of infective endocarditis. Lower extremity ultrasound helps in excluding venous thromboembolism which is unlikely in this patient.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Pulmonic Regurgitation

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## Question 277:

A 53-year-old man is brought to the emergency department with confusion and dysarthria. His blood glucose level on admission is 35 mg/dL. He is treated with 50 mL of 50% intravenous dextrose. However, he is admitted due to recurrent episodes of hypoglycemia. The patient needs a 10% dextrose infusion to maintain his blood glucose. Past medical history includes hypothyroidism and a recent diagnosis of hypertension. He currently takes levothyroxine 150 mcg and ramipril 5 mg daily. He does not smoke and only drinks 2-3 cans of beer on the weekend. Family history includes pancreatic cancer and hypothyroidism. Full blood count, bone profile, kidney, liver, and thyroid function are within normal limits. Hemoglobin A1c is 4.9%. Cortisol level is 8 mcg/dL. Results from a short ACTH stimulation test are shown below.

| | |
|---|---|
| Cortisol at 0 minutes | 10 µg/dL |
| Cortisol at 30 minutes | 22 µg/dL |

CT chest, abdomen, and pelvis are normal. Sulfonylurea screen and insulin antibody are negative. IGF-1 level is 150 ng/mL (reference range: 84-233 ng/mL). A set of investigations sent during a hypoglycemic episode is shown below.

| | Patient value | Reference range |
|---|---|---|
| Serum glucose | 40 mg/dL | 80–140 mg/dL (random) |
| Insulin | 1.3 microIU/mL | 1.4–14 microIU/mL |
| C-peptide | 0.8 ng/mL | 0.9–4.3 ng/mL |
| Beta-hydroxybutyrate | 5 mg/dL | 3 mg/dL |

Which of the following is the most likely cause of this patient's hypoglycemia?

## Choices:

1. Insulinoma
2. Non-islet cell tumor hypoglycemia
3. Ramipril
4. Exogenous insulin administration

## Answer: 3 - Ramipril

## Explanations:

- In the history, the patient was recently diagnosed with hypertension and started on ramipril 5 mg daily.
- Angiotensin-converting enzyme inhibitors have been reported to cause hypoglycemia.
- The mechanism is not clear. It is proposed that angiotensin-converting enzyme inhibitors increase insulin sensitivity.
- Insulin and C-peptide levels are low. This rules out insulinoma. However, IGF-1 levels are normal, and beta-hydroxybutyrate is high. Therefore, non-islet cell tumor hypoglycemia is unlikely. Measuring IGF-2 levels would be helpful. IGF-2 to IGF1 ratio of >10 is a useful marker to point towards non-islet cell tumor hypoglycemia. In exogenous insulin administration, insulin levels will be high and C-peptide low.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Non-diabetic Hypoglycemia

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 278:

A 67-year-old woman comes to the clinic with complaints of nausea, appetite loss, marked weakness, and fatigue. Her past medical history is remarkable for hypertension treated with calcium channel blocker amlodipine. The patient also has Crohn disease, for which she had been on oral budesonide for 13 months. She stopped taking the medication against the provider's advice nine days ago because she was unhappy with the budesonide-induced weight gain. The patient's vitals are temperature 98.6 F, pulse 100/min, respiratory rate 18/min, and blood pressure 100/70 mmHg without orthostatic changes. On physical exam, round and plethoric face and supraclavicular fat deposition are noted. Laboratory results reveal blood glucose 72 mg/dl, blood urea nitrogen 10 mg/dl, serum creatinine 0.9 mg/dl, serum sodium 130 mEq/L, serum potassium 4.4 mEq/L, calcium 9.6 mg/dl, bicarbonate 24 mEq/L, and chloride 96 mEq/L. The chest x-ray is normal. Which of the following biochemical abnormalities is most likely associated with this patient's medical condition?

## Choices:

1. High adrenocorticotropic hormone and low cortisol levels
2. Low adrenocorticotropic hormone and low cortisol levels
3. Low adrenocorticotropic hormone and low aldosterone levels
4. Low adrenocorticotropic hormone, low aldosterone, and low cortisol levels

## Answer: 2 - Low adrenocorticotropic hormone and low cortisol levels

## Explanations:

- This patient with nausea, loss of appetite, weakness, and fatigue following sudden discontinuation of chronic glucocorticoids (corticosteroids-budesonide) therapy- most likely has the suppression of the hypothalamic-pituitary-adrenal (HPA) axis leading to central adrenal insufficiency (AI).
- Glucocorticoids cause suppression of secretion of corticotropin-releasing hormone from the hypothalamus and adrenocorticotropic hormone from the anterior pituitary gland. The suppression of adrenal function is likely to occur in patients on glucocorticoid treatment for a prolonged period; patients who have received corticosteroids for less than three weeks are less likely to have hypothalamic-pituitary-adrenal axis suppression.
- Moreover, patients with a cushingoid appearance have higher chances of having a suppressed hypothalamic-pituitary-adrenal axis. Complete recovery of normal function of the hypothalamic-pituitary-adrenal axis after corticosteroid treatment may not occur for up to 0.5 to 1 year after discontinuation of the therapy. The diagnosis of central adrenal insufficiency starts with morning cortisol (low level) and adrenocorticotropic hormone (high in primary AI, low level in central AI).
- The renin-angiotensin-aldosterone system is the primary regulator of the aldosterone levels. Aldosterone will be normal in central adrenal insufficiency but low in primary adrenal insufficiency where deficiency of aldosterone causes renal sodium wasting, resulting in hyponatremia. Although hyponatremia may be found in central adrenal insufficiency because of increased antidiuretic hormone levels, it is usually mild. In primary adrenal insufficiency, elevated adrenocorticotropic hormone and reduced cortisol are seen. Besides, these patients have decreased levels of all adrenal cortical hormones, including aldosterone, cortisol, adrenal sex steroids. These patients typically have hyperpigmentation, hyperkalemia, and hyponatremia. Elevation of adrenocorticotropic hormone and cortisol can be due to stress(physiologic), such as hypovolemia, or pathological condition, ACTH-dependent Cushing disease.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Budesonide

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## Question 279: A 21-year-old Caucasian college graduate assigned male at birth presents with the desire to transition to the female gender. She was started on hormone therapy eight months ago (oral pills daily and twice-weekly patches). The patient is asking about the removal of male genitalia and vagina formation. The patient is concerned about her prominent “Adam’s apple” and hoarseness of voice. She wears gender-neutral clothing and has a somewhat masculine haircut. She usually presents as a male to work and female at home, and occasionally when she goes out at night. Her friends and family are supportive of her desire to change. She is smoking one pack of cigarettes per day and drinks two beer daily. She has no children. She is happy with the physical changes so far. What is the best next step in management?

## Choices:

1. Stop cross hormone therapy and refer the patient for psychiatric evaluation
2. Counsel about smoking cessation and make a referral for surgical evaluation
3. Counsel about smoking cessation and make a referral for speech therapy
4. Stop cross hormone therapy and refer the patient for surgical evaluation

## Answer: 3 - Counsel about smoking cessation and make a referral for speech therapy

## Explanations:

- The patient described has gender dysphoria. She was started on cross hormone therapy eight months ago (spironolactone 100 mg PO daily and estradiol patches twice weekly). The best next step in management is counseling about smoking cessation and make a referral for speech therapy. All patients should be counseled about smoking cessation to decrease the risk of venous thromboembolism.
- In the transgender female, the key issues include avoiding supraphysiologic doses or blood levels of estrogen that may lead to increased risk for thromboembolic disease, liver dysfunction, and hypertension. Speech and voice therapy can be offered to all transgender females. The methods used for voice feminization vary from professional techniques used for vocal training, speech therapy by trained speech pathologists, etc. Having voice and speech characteristics be in agreement with one's gender identity is often important to transgender individuals.
- In order to meet the criteria for surgical management, the individual should be on one year of continuous hormone therapy and living in the desired gender role. The above patient has been on treatment for only 8 months, so she doesn't meet the criteria for surgical management yet.
- Providers should measure serum estradiol and serum testosterone and maintain them at the level for premenopausal females (100 to 200 pg/mL and 50 ng/dL, respectively.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Gender Dysphoria

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## Question 280:

A 50-year-old male patient presents to the hospital with a past medical history of hypertension and weight loss of about 20 pounds (9 kg) over the past year. He was recently diagnosed with diabetes and started on metformin. His physical examination is unremarkable except for an erythematous papular rash around his mouth and extremities. He is also found to have hair loss and nail dystrophy. His blood work shows hemoglobin 10.2 g/dL (13.0- 17.7), HbA1c 6.7% (4.8-5.6), creatinine 0.96 mg/dL (0.76-1.27). His fasting glucagon levels are 720 pg/ml (normal 150 pg/ml). Which of the following trace mineral levels should be checked in his case?

## Choices:

1. Iodine
2. Magnesium
3. Zinc
4. Copper

## Answer: 3 - Zinc

## Explanations:

- Glucagonomas are neuroendocrine tumors of the pancreatic islets that secrete glucagon. Glucagonoma syndrome occurs due to the effects of elevated glucagon levels secreted by the tumor. Glucagonomas are neuroendocrine tumors originating from multipotential stem cells of endodermal origin. They arise from the alpha cells of the islets in the pancreas. Most glucagonomas are solitary. However, less than 10% of them have been associated with multiple endocrine neoplasia 1 syndrome (MEN1).
- Low zinc levels can be seen in patients with glucagonoma syndrome. It is also common to see low amino acid levels in patients with glucagonoma syndrome. Low zinc and amino acid levels have been implicated in the pathogenesis of necrolytic migratory erythema, the typical rash seen with glucagonoma syndrome.
- Glucagonomas are typically slow growing; however, they are usually advanced by the time of diagnosis. The predictors of survival are dependent on age, tumor grade, and distant metastases. The cure is rarely achieved once the tumor is metastatic.
- Nutritional support including supplementation of amino acids and zinc supplementation may help with the improvement of necrolytic migratory erythema.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Glucagonoma Syndrome

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## Question 281: A patient has a lingual thyroid on physical examination, which is true about a thyroid scan before surgery?

## Choices:

1. A thyroid scan has 100% sensitivity and specificity
2. It is done to exclude other sites of the thyroid tissues
3. The thyroid scan can diagnose all types of thyroglossal cysts
4. All patients with hypothyroidism should be evaluated with a thyroid scan

## Answer: 2 - It is done to exclude other sites of the thyroid tissues

## Explanations:

- Studies have shown the possibilities of dual and triple ectopic thyroids in some of the ectopic cases mandating to perform thyroid scan to exclude these possibilities.
- A thyroid scan can differentiate the ectopic thyroid from thyroglossal cysts rather diagnose the types of the thyroglossal cysts.
- Thyroid scan but not always 100% accurate.
- Physical examination is essential before performing any test.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Ectopic Thyroid

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## Question 282: A 45-year-old female presents to the clinic with a concern for osteoporosis. She sustained a right femoral neck fragility fracture three months ago, with a recent DEXA scan showing a Z-score less than -2. She denies any medical history or taking medications including over-the-counter drugs or herbal supplements. She reports a history of amenorrhea and unintentional weight gain of 8-10 kg in the last 12-18 months. Physical examination is significant for central obesity and thick purplish striae (>1 cm wide). Her body mass index is 29 Kg/m2. What is the next best step in the management of this patient?

## Choices:

1. Overnight 1 mg dexamethasone suppression test
2. Overnight 8 mg dexamethasone suppression test
3. CT scan of abdomen and pelvis
4. MRI brain

## Answer: 1 - Overnight 1 mg dexamethasone suppression test

## Explanations:

- Patient's history and physical examination are concerning for endogenous Cushing syndrome, which is causing secondary osteoporosis. The next step should be to screen for Cushing syndrome. Overnight 1 mg dexamethasone suppression test is a commonly used screening test for its diagnosis.
- In overnight 1 mg DST, dexamethasone 1 mg is administered orally between 11 PM and midnight. Serum cortisol levels are drawn the next morning between 8 and 9 AM.
- Serum cortisol level 1.8 mcg/dl suggest adequate HPA axis suppression by dexamethasone and exclude Cushing's syndrome. However, for levels > 1.8 mcg/dl, a second test (24-hour urinary free cortisol, late-night salivary cortisol or low dose two-day, 2 mg DST should be performed, prior to establishing a confirmed diagnosis of CS. At the cut-off value of 1.8 mcg/dl, overnight 1 mg DST provides a sensitivity of 95% and specificity of 86%.
- The other options (overnight 8 mg test, MRI brain, CT abdomen and pelvis), have no role in diagnosing CS. Rather, they help in establishing the etiology of CS.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Dexamethasone Suppression Test

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## Question 283:

A 3-year-old boy is being evaluated for fatigue, edema, seizures, and muscle cramps. TSH is within normal limits. Creatinine is 1.9 mg/dL, and liver function tests are slightly above the expected values. Serum calcium is 4 mg/dL, sodium 135 mEq/L, potassium 5.0 mEq/L, and bicarbonate 18 mEq/L. ECG reveals normal sinus rhythm and a QT interval of 0.5 seconds. He has a history of autosomal recessive polycystic kidney disease and awaits a kidney transplant. He was recently seen at the clinic with bone pain and bowed legs, for which he was prescribed a medication. A notable side-effect of this medication is suspected. Which of the following best identifies the primary target receptor of this medication?

## Choices:

1. G-protein coupled receptor
2. Sodium channels
3. Steroid response element-binding protein
4. Ryanodine receptors

## Answer: 1 - G-protein coupled receptor

## Explanations:

- Cinacalcet is indicated in hyperparathyroid states due to chronic kidney disease.
- It may cause hypocalcemia as a major side-effect. The child presents with symptoms of hypocalcemia, i.e. fatigue, seizures, muscle cramps, and a prolonged QT interval.
- Cinacalcet is a calcimimetic and acts on G-protein coupled receptors Gq and Gi. IP3/DAG system as the second messenger is activated.
- It leads to inhibition of parathyroid Hormone synthesis and secretion.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Cinacalcet

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## Question 284:

A 20-year-old male presents with fatigue. He has no past medical history, does not take any regular medications, and has no allergies. He vaguely remembers his mother telling him that his maternal grandmother had easy fatigability and was on potassium supplements. Both his parents are healthy. His vital signs are all within normal limits, and a systemic examination is unremarkable. Blood tests reveal sodium 140 mmol/L (135-145), potassium 2.4 mmol/L (3.5-5.0), Chloride 104 mmol/L (95-105), bicarbonate 29 mmol/L (18-22), creatinine 0.9 mg/dL (0.8-1.3) and magnesium 1.2 mmol/L (1.5-2.0). Urine studies reveal hypocalciuria. Where are the channels responsible for this patient's hypomagnesia?

## Choices:

1. Proximal convoluted tubule
2. Ascending limb of the loop of Henle
3. Distal convoluted tubule and duodenal cells
4. Collecting duct

## Answer: 3 - Distal convoluted tubule and duodenal cells

## Explanations:

- Gitelman syndrome is a form of renal magnesium and potassium wasting that is associated with hypocalciuria and metabolic alkalosis.
- Hypomagnesemia in Gitelman syndrome is due to a downregulation of the TRPM6 magnesium channels.
- The TRPM6 magnesium channels are located in the distal convoluted tubule and duodenal cells.
- The proximal convoluted tubule, loop of Henle, and collecting ducts are not the sites of TRPM6 downregulation in Gitelman syndrome.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Gitelman Syndrome

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## Question 285: A 45 year old female admitted with pneumonia. She has continued to be hypotensive despite fluids and antibiotics. Serum random cortisol is 5 mcg/dl. A 250 mcg cosyntropin stimulation test is done. Which of the following result will rule out adrenal insufficiency?

## Choices:

1. 5 micrograms per dL
2. 10 micrograms per dL
3. 12 micrograms per dL
4. 20 micrograms per dL

## Answer: 4 - 20 micrograms per dL

## Explanations:

- The adrenocorticotropic hormone (ACTH) test evaluates adrenal function.
- 0.25 mg of ACTH is given intramuscularly or intravenously, and serum cortisol is measured.
- The normal serum cortisol level is a rise of to18 micrograms per dL.
- Adrenal insufficiency should be considered in critically ill patients when hypotension does not respond to fluid resuscitation.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Adrenocorticotropic Hormone Test

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## Question 286:

A male complains of progressive fatigue, weakness, and weight gain. He has no significant past medical history. Exam shows an obese male with fat deposition at the posterior neck, face, and trunk. Purple striae are present over the abdomen. Which of the following can be used to treat this condition?

## Choices:

1. Digoxin
2. Spironolactone
3. Ketoconazole
4. Misoprostol

## Answer: 3 - Ketoconazole

## Explanations:

- Ketoconazole is a potent inhibitor of gonadal and adrenal steroid hormone synthesis.
- Ketoconazole is often used to treat Cushing syndrome.
- Patients may have history of weight gain, fatigue, weakness, delayed wound healing, easy bruising, back pain, bone pain, loss of height, depression, mood swings, emotional reactivity, loss of libido, erectile dysfunction in males, irregular menstrual cycles in females, infertility, hyperhidrosis, hirsutism, and difficulty in combing hair or rising from sitting position. Patients may also have a history of hypertension and diabetes mellitus.
- The best initial test for diagnosis of Cushing syndrome is 24-hour urinary cortisol estimation. Alternatively, midnight serum or salivary cortisol levels or a low dose dexamethasone suppression test can be used to confirm hypercortisolism. MRI pituitary gland, unenhanced CT scan of adrenals, and chest x-ray and CT are also obtained to localize the pathology.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Cushing Syndrome

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## Question 287:

A 34-year-old woman presents to the clinic for evaluation. She weighs 230 pounds, and her BMI is 44 $kg/m^2$. An initial set of investigations shows increased levels of tumor necrosis factor-alpha, IL-17, IL-6, and interleukin-1-beta. However, she has a low level of anti-inflammatory cytokines. Which of the following is likely to cause the most damage to this patient's cartilage?

## Choices:

1. IL-6
2. IL-17
3. Tumor necrosis factor-alpha
4. Interferon-gamma

## Answer: 2 - IL-17

## Explanations:

- The adipose tissue of obese individuals is infiltrated with pro-inflammatory T-cells and macrophages and causes the accumulation of tumor necrosis factor-alpha, IL-17, IL-6, and interleukin-1-beta. In lean individuals, M2 macrophages, Th2, and Tregs, which produce anti-inflammatory cytokines such as IL-10, IL-5, and interferon-gamma, are present in the adipose tissue.
- IFN-gamma is a central regulator of macrophage function.
- According to research, obese IFN-gamma-knockout animals, compared with obese wild-type control animals, demonstrate modest improvements in insulin sensitivity, decreased adipocyte size, and an M2-shift in ATM phenotype and cytokine expression.
- The pro-inflammatory cytokine interleukin (IL)-17 has been associated with tissue inflammation. Obese individuals have symptoms of low-grade chronic inflammation, indicating a relationship between IL-17A and adipose tissue inflammation.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Pathophysiology of Obesity

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## Question 288: A 48-year-old male patient with hypercalcemia on routine blood work is found to have primary hyperparathyroidism on further workup. Recent blood tests also reveal a 25-hydroxyvitamin D level of 13 mg/dl. The patient is planned for a Sestamibi scan and thyroid ultrasound to look for a possible parathyroid adenoma. As the workup continues, which of the following would provide an added benefit to the patient?

## Choices:

1. Do not replete vitamin D until parathyroidectomy is completed
2. Start calcitriol 0.5 mcg daily
3. Start vitamin D3 1,000 international units daily
4. Start vitamin D2 50,000 international units daily

## Answer: 3 - Start vitamin D3 1,000 international units daily

## Explanations:

- A study by Rolighed et al. showed that Vitamin D replacement is safe in patients with primary hyperparathyroidism in a dose of 2,800 IU daily. Repleting vitamin D reduced parathyroid hormone (PTH) levels, improved bone mineral density (BMD) before surgery, and did not increase hypercalcemia or urinary calciuim excretion.
- Calcitriol should be used in those with end-stage renal disease who are unable to make active vitamin D. This patient does not require calcitriol at this time.
- Vitamin D3 supplementation should be given at a conservative dosing of 1,000 - 2,000 IU daily.
- Vitamin D2 50,000 IU once per week can be utilized in non-hypercalcemic patients for this level of vitamin D deficiency, but data is not available to support this aggressive level of replacement in the setting of hypercalcemia, and it may even cause a risk to the patient. Vitamin D2 50,000 IU daily would lead to intoxication.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hungry Bone Syndrome

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## Question 289:

A 48-year-old man presents to the hospital with recurrent episodes of sweating, shaking, blurred vision, and hunger for the last 3 months. This has been getting progressively worse. The patient usually eats sugary foods to terminate these symptoms. He describes that in the last 2 weeks, his days revolve around food. Three days ago, he was brought to the emergency department with collapse. At that time, his blood glucose was 42 mg/dL. He improved after treatment with IV glucose. He has been losing weight despite eating at regular intervals (12 kgs in 3 months). He has a history of hypertension and takes amlodipine 5 mg daily. He does not smoke. He used to drink 6 units of alcohol per week but has not consumed any alcohol for 6 weeks. He denies any illicit drug use. His height is 181 cm, and his weight is 63 kg. Examination reveals a palpable abdominal mass. Further investigation reveals

| | Patient value | Reference range |
|---|---|---|
| Plasma insulin | 0.2 microU/mL | 1.4-14 microU/mL |
| C-peptide | 0.4 ng/mL | 0.9-4.3 ng/mL |
| Plasma glucose | 30 mg/dL | 80–140 mg/dL |
| Beta-hydroxybutyrate | Undetectable | 0.5 mmol/L |
| IGF-1 | 48 ng/mL | 91-246 ng/mL |
| 9 AM cortisol | 20 mcg/dL | 5-25 mcg/dL |

CT abdomen reveals 20 cm x 10 cm x 10 cm retroperitoneal mass. Which of the following is the most likely cause of the patient's hypoglycemia?

## Choices:

1. Insulin overdose
2. Retroperitoneal sarcoma
3. Addison disease
4. Reactive hypoglycemia

## Answer: 2 - Retroperitoneal sarcoma

## Explanations:

- The patient's history is suggestive of non-islet cell tumor hypoglycemia. This is a rare paraneoplastic syndrome resulting in hypoinsulinemic hypoglycemia.
- A low IGF-1 in the context of abdominal mass, hypoglycemia, low insulin, and C-peptide is suggestive of non-islet cell tumor hypoglycemia.
- Beta-hydroxybutyrate will also be low in this condition.
- Retroperitoneal sarcoma is one of the causes of non-islet cell tumor hypoglycemia.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Non-diabetic Hypoglycemia

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## Question 290:

A 16-year-old girl is brought to the clinic by her mother with a complaint of headaches. She is above the 99th percentile for her age, standing tall at 6 feet two inches. Her features are coarse on appearance, with swollen and sweaty hands. The mother complains she has not had her menarche yet. All the persons in her family are of average height. Lab investigation reveals raised insulin growth factor 1 (IGF-1) and impaired HbA1c. Which of the following is the best initial therapy for this patient?

## Choices:

1. Somatostatin analogs
2. Insulin infusion
3. Demeclocycline
4. Exogenous thyroxine

## Answer: 1 - Somatostatin analogs

## Explanations:

- This patient likely has gigantism which refers to the excessive production of growth hormone that leads to increased linear bone growth as compared to acromegaly which excessive production of growth hormone following epiphyseal bone fusion.
- It is one of the causes of hyperpituitarism resulting from growth hormone-secreting pituitary adenoma. Increased production of growth hormone, would result in increased IGF-1 production in the liver. IGF-1 mediates the protein anabolic and growth-promoting effect of growth hormone.
- The treatment involves the utilization of somatostatin analogs such as octreotide or surgery. Somatostatin prevents the release of growth hormone from the anterior pituitary.
- Clinical hypothyroidism has been found to be associated with decreases in serum levels of IGF-1. IGF-1 is produced in the liver under the action of growth hormone. Severe liver disease affecting synthetic function will reduce IGF-1 production.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hyperpituitarism

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## Question 291:

An 18-year-old male presents to the clinic for the follow-up of previously diagnosed diabetes mellitus. The patient states that in his previous hospitalization he was found to have elevated blood sugar, nausea, vomiting, and abdominal pain. At that point, his HbA1c was found to be 13.2. He also had a positive GAD-65 and islet cell antibody. The patient says he was discharged from the hospital on 25U of insulin glargine and 5U insulin aspart to be taken with meals plus a sliding scale. He says he recently saw multiple commercials for other medications for diabetes including semaglutide, glimepiride, and empagliflozin and wants to know if he can have a prescription for one of these medications. Which of the following recommendations will you make to the patient?

## Choices:

1. Explain the risks and benefits of semaglutide and then write a prescription for this medication
2. Explain the risks and benefits of glimepiride and then write a prescription for this medication
3. Explain the risks and benefits of empagliflozin and then write a prescription for this medication
4. Explain to the patient that semaglutide, glimepiride, and empagliflozin are not approved for this indication

## Answer: 4 - Explain to the patient that semaglutide, glimepiride, and empagliflozin are not approved for this indication

## Explanations:

- Sulfonylureas, GLP-1 agonists, and SGLT-2 inhibitors are not indicated in type 1 diabetes.
- Positive GAD-65 antibodies and islet cell antibodies are consistent with type 1 diabetes.
- Medications indicated in type 1 diabetes include insulin and pramlintide.
- Symptoms consistent with DKA include high blood sugar levels, nausea, vomiting, abdominal pain, confusion, and fruity breath.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Sulfonylureas

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## Question 292: A female presents with fatigue, acne, weight gain, and amenorrhea. She has gained 25 pounds (11 kg) over the past 6 months. She has been amenorrheic for 4 months and multiple pregnancy tests have been negative. She has striae at both flanks, a moon face, and a buffalo hump. Which diet is most appropriate for this patient?

## Choices:

1. Low protein
2. Low sodium
3. Low potassium
4. High carbohydrate

## Answer: 2 - Low sodium

## Explanations:

- Cushing syndrome is caused by prolonged exposure to high circulating levels of cortisol.
- ACTH-dependent cortisol excess due to a pituitary adenoma is called Cushing disease.
- Patients with Cushing syndrome tend to have decreased urinary sodium excretion due to the mineralocorticoid activity of excessive cortisol levels.
- A low sodium diet is recommended.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Cushing Syndrome

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## Question 293:

A 52-year-old woman presents to the clinic with persistent generalized bone pains and increasing difficulty in coping with her daily activities. She just retired from a metal factory. She developed excruciating pain in the right thigh a week ago. An x-ray showed Looser's zones in the right upper femur. She has a 20 pack-year history of cigarette smoking and had attained natural menopause 15 months ago. Her blood pressure is 160/100 mmHg and serum creatinine 2.2 mg/dL. A DEXA-scan (dual-energy x-ray absorptiometry scan) for bone mineral density shows osteoporosis of both hips and lumbar spine and osteopenia of the distal radii. What additional sets of findings is most likely to be present in this patient?

## Choices:

1. Hypophosphatemia, high parathyroid hormone (PTH), and hypercalciuria
2. Hypophosphaturia, hypercalcemia, and high PTH
3. Metabolic alkalosis, hypophosphatemia, and hyperphosphaturia
4. Metabolic acidosis, hypercalciuria, and hyperphosphatemia

## Answer: 1 - Hypophosphatemia, high parathyroid hormone (PTH), and hypercalciuria

## Explanations:

- This patient has two risk factors for cadmium toxicity, i.e., working at a metal factory and cigarette smoking. She most likely has a cadmium-induced bone disease characterized by osteomalacia, osteoporosis, fractures, a proximal tubular acidosis, and nephropathy.
- Cadmium causes renal disease and affects tubular reabsorption of many substances in the proximal nephron mimicking Fanconi syndrome. These substances include phosphate, calcium, bicarbonate, and amino acids.
- Hypercalciuria causes increased dissolution of bone by the action of increased PTH. Unfortunately, PTH is unable to convert 25 hydroxyvitamin D3 to the active 1,25 dihydroxy vitamin D3. Intestinal absorption of calcium diminishes as a result. The rising PTH aggravates hyperphosphaturia and hypophosphatemia by its action on the proximal convoluted tubules of the kidneys.
- Cadmium has independent effects on bone formation by inhibiting stem cells from differentiating into osteoblasts.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Heavy Metal Toxicity

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## Question 294:

A 44-year-old man has complaints of inability to fall asleep and difficulty breathing during the night. His past medical history is significant for hypertension on hydrochlorothiazide. The physical exam is remarkable for class 1 obesity and neck circumference of 44 cm. He is diagnosed with severe obstructive sleep apnea using polysomnography. Which of the following hormones is most likely decreased in this patient?

## Choices:

1. Oxyntomodulin
2. Leptin
3. Ghrelin
4. Peptide tyrosine tyrosine

## Answer: 2 - Leptin

## Explanations:

- Sleep deprivation and reduced sleep quality result in decreased levels of leptin, which then results in increased appetite and reduced energy expenditure.
- Severe obstructive sleep apnea results in decreased quality sleep duration and has adverse health outcomes in relation to obesity.
- As a consequence, poor sleep quality results in decreased leptin and increased BMI.
- Leptin deficiency is also associated with dysregulation of cytokine production, increased susceptibility to infections, autoimmune disorders, malnutrition, and inflammatory responses.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Physiology, Obesity Neurohormonal Appetite And Satiety Control

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## Question 295:

A 25-year-old man presents to the clinic with a chief complaint of left hip joint pain for the past year. He also reports a history of right leg pain six months back, which was relieved with ibuprofen. On examination, mild tenderness is present on the lateral aspect of the left hip, but the hip range of motion is normal. His serum phosphate level is 8 mg/dL, while serum calcium and 1,25 hydroxyvitamin D levels are within normal limits. The plain radiograph of the left hip reveals a calcified mass on the lateral aspect of the greater trochanter of the femur. Which of the following is the next best step in the management of this patient?

## Choices:

1. Calcium supplements
2. High-protein diet
3. Acetazolamide
4. Surgical removal

## Answer: 3 - Acetazolamide

## Explanations:

- The clinical vignette is that of a patient with hyperphosphatemic tumoral calcinosis. The treatment options for this disease are based on previous case reports and cohort studies, and there is a lack of level 1 evidence regarding any of them.
- The first-line treatment involves phosphate-binding resins like sevelamer, acetazolamide, probenecid, nicotinamide, and niacinamide to decrease the blood levels of phosphate. Surgical management is restricted to patients with severe disabilities.
- The history of leg pain suggests hyperostosis, which requires symptomatic management in the form of analgesics.
- Calcium supplements, a phosphate-rich diet (including nuts), and vitamin D supplements should not be given to such patients.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hyperphosphatemic Tumoral Calcinosis

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## Question 296: A 32-year-old African American female with sarcoidosis complains of polyuria which is found to be secondary to the sarcoidosis. Which of the following is most likely true?

## Choices:

1. Vasopressin injection in a water deprivation test raises urine osmolality greater than 9%
2. There is low serum osmolality with high urine osmolality
3. Vasopressin has no affect on urine osmolality during a water deprivation test
4. There is a high serum glucose with a high urine osmolality

## Answer: 1 - Vasopressin injection in a water deprivation test raises urine osmolality greater than 9%

## Explanations:

- Sarcoidosis can cause central diabetes insipidus (DI).
- If vasopressin has a large affect, DI is central in origin.
- If vasopressin does not have an affect, DI is nephrogenic in origin.
- High glucose with high urine osmolality is seen in diabetes mellitus.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Diabetes Insipidus

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## Question 297:

A 67-year-old female is scheduled to receive radioactive iodine (RAI) therapy for toxic multinodular goiter. Her past medical history includes congestive heart failure and peripheral arterial disease. She has a 25 pack-year smoking history. What medication should this patient receive prior to RAI therapy?

## Choices:

1. Dextrose 5% in normal saline
2. Methimazole
3. Levothyroxine
4. Recombinant Human Thyrotropin (rhTSH)

## Answer: 2 - Methimazole

## Explanations:

- The American Thyroid Association (ATA) recommends the administration of a beta-blocker or methimazole in elderly patients and in those with significant cardiovascular co-morbidities undergoing RAI therapy for toxic multinodular goiter.
- This thyroid blockade is recommended in order to prevent transient thyrotoxicosis from thyroid cell death and subsequent thyroid hormone release.
- Transient thyrotoxicosis is especially dangerous in the elderly and those with significant cardiovascular co-morbidities due to the increased cardiovascular stress (increased cardiac output and contractility) in a hyperthyroid state.
- Methimazole prevents iodine organification by inhibiting the enzyme thyroid peroxidase.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### 131 I Sodium Iodide

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## Question 298: A 15-year-old girl is brought to the clinic with primary amenorrhea. Physical examination shows no acne, no axillary or pubic hair but normal breast development. The examination of the inguinal area shows firm slippery masses bilaterally. External genitalia appears to be female. Karyotype type analysis showed 46 XY genotype. USG abdomen reveals the absence of ovaries, fallopian tubes, uterus, and upper vagina. Lab investigations show serum testosterone 4.5 mIU/mL, serum dihydrotestosterone (DHT) 400 pg/mL, LH 16 mIU/mL, FSH 5.5 mIU/mL, and estradiol 150 pg/mL. What is the most likely molecular defect in this disease?

## Choices:

1. Loss of function mutation in the AR gene
2. CYP21A gene mutation
3. SRD5A2 gene mutation
4. SRD5A1 gene mutation

## Answer: 1 - Loss of function mutation in the AR gene

## Explanations:

- Androgen insensitivity syndrome (AIS), also known as testicular feminization, is an X-linked recessive condition caused by a mutation in the AR gene.
- This condition causes failure of masculinization in the external genitalia of male genotypes.
- Affected persons have normal testes with the normal production of testosterone and its conversion to dihydrotestosterone (DHT).
- The testes produce normal amounts of müllerian-inhibiting substance (MIS) or anti-müllerian hormone/factor; affected individuals do not have ovaries, fallopian tubes, a uterus, or a proximal vagina.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Embryology, Sexual Development

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## Question 299:

A 50-year-old woman presents to the clinic for follow up. She recently experienced menopause. She has hypertension which is well controlled on an losartan and type 2 diabetes, which is controled with dietary modifications. However her LDL-cholesterol (LDL-C) is 130 mg/dL and triglycerides (TG) are 240 mg/dL. She has been recommended statins in the past but declines to take them and asks for alternative medication. She is prescribed colesevelam at half the maximum dose and and asked to follow up in 3 months. Which of the following best describes the most likely expected findings after 3 months?

## Choices:

1. LDL-C 110 mg/dL with TG of 270 mg/dL
2. LDL-C of 111 mg/dL with TG of 200 mg/dL
3. LDL-C 0f 100 mg/dL with TG of 230 mg/dL
4. No change

## Answer: 1 - LDL-C 110 mg/dL with TG of 270 mg/dL

## Explanations:

- Bile acid sequestrants (BAS) such as colesevelam, colestipol, and cholestyramine, are approved by the Food and Drug Administration (FDA) in combination with restriction of dietary saturated and trans-fatty acids to manage hypercholesterolemia. They are indicated for patients with hypercholesterolemia without hypertriglyceridemia.
- BAS are very useful in patients who are statin-intolerant (myalgia and myopathy) and can be used in combination with niacin and the cholesterol absorption inhibitor, ezetimibe, to achieve target goals in patients in both primary and secondary prevention. They can lower LDL-C between 15-30% if tolerated by patients.
- As monotherapy in the Lipid Research Clinics- Coronary Primary Prevention Trial (LRC-CPPT), they reduced low-density lipoprotein cholesterol (LDL-C) by 20% and cardiovascular events.
- LDL-C and hemoglobin HbA1c were shown to be reduced in three double-blinded placebo controlled trials with the use of colesevelam HCL (COL) in type 2 diabetes (T2D) patients. These results led to the FDA approval of COL as an adjuvant to exercise and dietary restriction for improving glycemic control in patients with T2D. Therefore, COL therapy is effective for patients with diabetes who have not met their HbA1c goal of less than 7% or LDL-C goal of less than 100 mg/dL or 30%-49% or more than 50% reduction in LDL-C. The main advantage of using BAS is that it can safely be administered in combination with other anti-diabetic medications and statins.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Antilipemic Agent Bile Acid Sequestrants

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## Question 300:

A 12-year-old African American girl with a past medical history of Graves disease presents to the emergency department with symptoms of excessive urination and thirst for the last three days. Her mother has Hashimoto thyroiditis and Addison disease. Her vitals show blood pressure 90/60 mmHg, pulse 100/min, temperature 37 C, and respiratory rate 14/min. Her mucosal membranes are dry. The patient has a fruity breath order. Which of the following laboratory findings is most likely to be present in this patient?

## Choices:

1. Elevated beta-hydroxybutyrate level
2. Normal anion gap
3. High bicarbonate level
4. High C peptide level

## Answer: 1 - Elevated beta-hydroxybutyrate level

## Explanations:

- The clinical vignette is most consistent with diabetes mellitus type 1, a common manifestation in polyglandular autoimmune syndrome type 2. The most common symptoms of diabetes mellitus type 1 are polydipsia, polyuria, and weight loss.
- Age less than 5, low socioeconomic status, and ethnic minority are known risk factors for diabetic acidosis at the initial presentation of type 1 diabetes mellitus.
- Diabetic ketoacidosis can be a life-threatening complication characterized by hyperglycemia, metabolic acidosis with a high anion gap, and ketosis.
- Diabetes mellitus type 1 is an autoimmune disease that can be confirmed by low insulin, low c-peptide, and positive islet cell antibodies or glutamic acid decarboxylase (GAD) antibodies.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Polyglandular Autoimmune Syndrome Type II

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## Section 4

Question 301: Which of the following patients with papillary thyroid carcinoma has the best prognosis?

Choices:

1. A 65-year-old female, with a well-differentiated tumor, with invasion outside of the capsule
2. A 30-year-old male, with a well-differentiated tumor and lymph nodal metastasis found in the central compartment
3. A 48-year old male, with a poorly differentiated 2 cm tumor
4. A 40-year-old female, with a well-differentiated 2 cm tumor and distant metastasis found in the lung

## Answer: 2 - A 30-year-old male, with a well-differentiated tumor and lymph nodal metastasis found in the central compartment

## Explanations:

- Papillary thyroid carcinoma (PTC) is unique among other malignancies in that age is a significant predictor of future prognosis.
- For males younger than 45 years old, patients cannot score a cancer stage further than stage 2. A PTC with lymph node metastasis is a stage 1 PTC. Some authorities use a cut-off of 55 years.
- Further staging of PTC for young patients is contingent on metastasis. Nodal metastasis does not appear to have a significant impact on prognosis, whereas distant metastasis in other organs does affect staging.
- The degree of differentiation, size of tumors, and presence of invasions are all important prognostic factors for PTC.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Papillary Thyroid Carcinoma

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## Question 302:

A 35-year-old Asian female presents with excessive weight gain. She started gaining weight when she was 10 years old. Her diet consists of 3 cups of rice per meal and sugary food. Her past medical history is remarkable for diabetes mellitus type 2 and is maintained on metformin 800 mg twice per day. She has an irregular cycle of menstruation and is living a sedentary lifestyle. The vital signs show a blood pressure of 140/90 mmHg, temperature 37.5 C (99.5 F), cardiac rate 90/min, and a respiratory rate of 22 breaths/min. Her height is 5 feet and 2 inches (157 cm), weight 170 lbs (77 kg), and has a BMI of 31 kg/m2. The physical exam shows acne, hirsutism, and her body fat is concentrated on the abdominal area. The laboratory exam shows a fasting blood glucose 130 mg/dL, HbA1c 8%, LDL 130 mg/dL, HDL 30 mg/dL, triglycerides 180 mg/dL, and a total cholesterol of 250 mg/dL. Which of the following findings will be seen if this patient has a rapid weight loss?

## Choices:

1. Hypokalemia
2. Hypouricemia
3. Normal heart rhythm
4. Bladder stones

## Answer: 1 - Hypokalemia

## Explanations:

- The most common electrolyte abnormality encountered in patients with obesity who have a rapid weight loss is hypokalemia.
- Obesity is the excessive or abnormal accumulation of fat or adipose tissue in the body that impairs health via its association with diabetes mellitus, cardiovascular disease, hypertension, and hyperlipidemia. It results from an imbalance between daily energy intake and energy expenditure, resulting in excessive weight gain.
- Obesity should focus on findings like acne, hirsutism, skin tags, acanthosis nigricans, striae, Mallampati scoring, buffalo hump, fat pad distribution, irregular rhythms, gynecomastia, abdominal pannus, hepatosplenomegaly, hernias, hypoventilation, pedal edema, varicoceles, stasis dermatitis, and gait abnormalities.
- In patients with rapid weight loss, hyperuricemia is seen and not hypouricemia. Cardiac arrhythmias are encountered in patients with rapid weight loss instead of normal heart rhythm. Urolithiasis is not an effect of rapid weight loss.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Obesity

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## Question 303:

A 10-year-old male patient presents for sports physical at his primary care clinic. Upon physical examination, a slight curvature of the spine and pes planus is noted. A review of the electronic medical record (EMR) shows inconsistent good visits and no history of physical abnormalities. The child's current height is 60 inches (152 cm/ 98th percentile); the child's current weight is 70 lbs (42.5 kg /47th percentile). There is a history of referral for physical therapy at age 5, speech therapy at age 7, and behavioral therapy within the past year with no follow-up after referral. It is also observed that the child has pronounced body hair and slight facial hair. What is the next step in the physical examination?

## Choices:

1. Complete the sports physical examination, and request a follow-up visit for further assessment of developmental abnormalities.
2. Assess for and refer the child for imaging with X-ray and MRI of the spine to evaluate for anatomical abnormalities.
3. Stop the sports physical examination, and interview the parent or caregiver and to inquire about missing information in the EMR.
4. Stop the sports physical examination, and refer the child to pediatric endocrinology for evaluation of growth hormone and/or sex hormone abnormalities.

Answer: 1 - Complete the sports physical examination, and request a follow-up visit for further assessment of developmental abnormalities.

## Explanations:

- Higher than average height among boys is a common feature of both XYY (Jacobs) and XXY (Klinefelter) syndromes.
- Early signs of puberty are common among boys with XYY (Jacobs) syndrome.
- Global developmental delays (e.g., speech, gross motor, fine motor, social-emotional deficits) are common among boys with genetic disorders, such as XYY (Jacobs) and XXY (Klinefelter) Syndromes.
- Scoliosis and pes planus are common features of XYY (Jacobs) syndrome.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Jacobs Syndrome

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## Question 304:

A 65-year-old female presents to the emergency department with a chief complaint of altered mental status. The patient was found unresponsive. Her heart rate is 110/min; the blood pressure is 90/60 mmHg, respiratory rate 12 breaths per minute, SpO2 98% on room air, finger-stick glucose is 125mg/dL. Initial resuscitative and evaluation measures are appropriately implemented. The patient's home-health attendant states that the patient has been refusing oral intake except for toast and drinks tea exclusively. During the evaluation, the patient suffers a tonic-clonic seizure that is successfully aborted with 4 mg of intravenous lorazepam. The basic metabolic panel shows Na 113 mmol/L. The first-line treatment for this condition is administered, and the patient is eventually admitted to the medical ICU. Several days later, the patient again seizes and is found to have decreased reflexes. Repeat serum sodium is within normal limits. What is the likely iatrogenic cause of the patient's deteriorating condition?

## Choices:

1. Bacterial meningitis
2. Hypoglycemia
3. Central pontine myelinolysis
4. Subarachnoid hemorrhage

## Answer: 3 - Central pontine myelinolysis

## Explanations:

- Overcorrection of serum sodium, particularly when chronically low can lead to the devastating condition of central pontine myelinolysis.
- The "tea and toast" diet is a common etiology of hyponatremia, other potential causes include beer potomania, cerebral salt wasting, and SIADH.
- Serum sodium should be corrected at a rate not faster than 6-12 mEq in the first 24 hours and no more than 18 mEq in 48 hours.
- 3% Sodium Chloride is indicated in this patient given acute neurologic sequelae of severe hyponatremia.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Crystalloid Fluids

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## Question 305:

A 12-year-old boy presents to the clinic for yellow-white plaques on his extensor tendons. Lipid screening panel reveals hypercholesterolemia. A plant sterol panel is also ordered, which reveals sitosterolemia. Mutations of which of the following pairs of genes is most likely responsible for the patient's disorder?

## Choices:

1. BRCA1 and BRCA2
2. ABCG5 and ABCG8
3. AEF5 and ARF6
4. HFE2 and HFE5

## Answer: 2 - ABCG5 and ABCG8

## Explanations:

- ABCG5 and ABCG8 are the genes responsible for encoding the ABC transporter proteins, which ensure optimal plant sterol metabolism.
- Mutations in the ABCG5 and ABCG8 genes result in defunct ABC transporter proteins.
- ABCG5 and ABCG8 encode for sterolin-1 and sterolin-2, which are components of the ABC transporter proteins.
- Genetic testing is not required to make the diagnosis of sitosterolemia but can provide confirmation.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hereditary Sitosterolemia

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## Question 306:

A 39-year-old male patient presents to the primary care provider with a complaint of a rash on his thigh and weight loss for the past four months. He has lost 15 pounds (7 kg) in the last four months unintentionally. He also complains of feeling fatigued most of the time. His vital signs are normal temperature, blood pressure: 120/80 mmHg, respiratory rate: 16 per minute, and pulse rate: 70 per minute. His blood glucose on the presentation is 250 mg/dl. He does not have any history of diabetes mellitus. On physical examination, there is a round lesion on the right thigh that has a specific and healed center, and the periphery of the lesion has a painful annular ulcer. Which of the following is the most appropriate diagnostic test?

## Choices:

1. To check serum Insulin levels
2. To check serum glucagon levels
3. To check serum vasoactive intestinal peptide levels
4. To check serum thyroxine levels

## Answer: 2 - To check serum glucagon levels

## Explanations:

- The rash in this vignette is necrolytic migratory erythema. It starts as a scaly plaque over the face, trunk, or extremities. This rash evolves into a centrally healed lesion surrounded by the painful ulcerative one, which is characteristic of glucagonoma.
- Increased blood sugar without any history of diabetes mellitus or any family history of diabetes concerns for increased glucagon levels.
- The patient has glucagonoma. Serum glucagon levels are increased in this kind of pancreatic neuroendocrine tumor.
- Serum insulin levels are increased in insulinoma. Increased serum vasoactive intestinal peptide is present in VIPoma. Watery diarrhea, achlorhydria, and hypokalemia are the salient features of VIPoma syndrome. Serum thyroxine levels are often increased in graves' disease.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Pancreatic Islet Cell Cancer

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## Question 307:

A 65-year-old man presents to the clinic for follow up. He was diagnosed with normocalcemic primary hyperparathyroidism during a routine biochemical multiphasic screening 8 months ago. This was repeated, and the diagnosis was confirmed. A DEXA scan revealed a T score of -2.6 at the hip, and parathyroidectomy (PTX) was recommended. Subsequently, a cervical ultrasound revealed a hypoechoic nodule in the right inferior pole of the thyroid. A Tc 99m sestamibi nuclear scan was negative. His past medical history is significant for long-standing hypertension well controlled on diltiazem. Ten days after the investigations, PTX using a minimally invasive surgical approach revealed a right lower parathyroid adenoma, which was successfully excised. The preoperative serum intact PTH level was 118 pg/mL. Fifteen minutes after excision, the intraoperative serum PTH (ioPTH) was 43 pg/mL. The pathology report confirmed the excised tissue was a parathyroid adenoma with a predominance of oxyphil cells. A PTH level 6 months after surgery was 46 pg/mL (normal range 10-65 pg/mL). Which of the following best explains the most likely reason for the patient's negative sestamibi scan?

## Choices:

1. Presence of a single parathyroid adenoma
2. A drop in ioPTH from 118 to 43 pg/mL in 15 minutes
3. Anti-hypertensive treatment
4. Oxyphil predominance in the parathyroid adenoma

## Answer: 3 - Anti-hypertensive treatment

## Explanations:

- This patient was on calcium channel blocker therapy (diltiazem), which prevents the uptake of the radiotracer material into the parathyroid glands and was a reason for the negative scan.
- The presence pathology in multiple glands is another reason for a negative scan because of preferential uptake of tracer by one gland over the others. This patient had a single adenoma.
- Oxyphil cells are rich in mitochondria, which avidly take up the tracer. The sparsity of these cells results in negative scans. This patient had an oxyphil adenoma.
- PTH has a short half-life of 2 to 4 minutes in the blood. A drop of more than 50 percent in serum PTH after 15 minutes during intraoperative monitoring confirms the removal of all abnormal parathyroid tissue (Miami criterion). In this patient, this drop in PTH was after the removal of a single adenoma, confirming the absence of multi-glandular disease (a frequent reason for a negative scan result).

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Normocalcemic Hyperparathyroidism

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## Question 308:

A 54-year-old woman presents to the clinic for fatigue and mild weight loss. For the past several weeks, she has had hot flashes, trouble sleeping, and heat intolerance. She does not have tremors, palpitations, eye discomfort, weakness, neck pain, or diplopia. Her past medical history is notable for hypertension, treated with hydrochlorothiazide and metoprolol. Her mother has hypertension and osteoporosis. The patient experienced natural menopause at age 49 years. Eye examination shows mild lid lag but no proptosis. Neck examination shows a 2.6 cm nodule in the right lobe of the thyroid gland. Labs show TSH 0.03 mIU/I, T3 200 ng/dL, FT4 1.8 ng/dL (reference range: 0.9-1.7 ng/dL). Thyroid ultrasound shows a 2.6 cm right lobe solitary thyroid nodule. Radioactive iodine uptake (RAIU) test at 24hrs is 30% (normal 10-30%), predominantly in the nodule with minimal surrounding uptake. Beta-blocker therapy is initiated for her symptoms. Which of the following is the next best step in the management of this patient?

## Choices:

1. Fine needle aspiration cytology of the right thyroid nodule
2. Long term methimazole therapy
3. Prednisone
4. Radioactive iodine ablation

## Answer: 4 - Radioactive iodine ablation

## Explanations:

- The patient has hyperthyroidism with a large thyroid nodule, and the initial evaluation includes TSH and thyroid USG. Patients with suppressed TSH and benign USG findings should then undergo RAIU scintigraphy to differentiate toxic adenoma from Graves.
- Patients with toxic adenoma have mildly elevated to high normal RAIU concentrated in the nodule.
- Patients with multinodular goiter or toxic adenoma with overt hyperthyroidism (increased T4, low TSH) should have definitive treatment with radioactive iodine ablation or surgical thyroidectomy.
- FNA is indicated for cold (hypofunctioning) nodules and malignancy USG findings like microcalcifications, increased vascularity. Here the nodule is hyperfunctioning without malignancy suspicion. Prednisone decreases the peripheral conversion of T4 to T3 and used in Graves, severe hyperthyroidism, and thyroid storm, but is not indicated in toxic adenoma or multinodular goiter. Methimazole can decrease thyroid hormone production in preparation for radioiodine ablation or surgery. This is only used chronically in toxic nodular disease if the patient is a poor surgical candidate or declining definitive therapy.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Plummer Disease

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## Question 309: A 56-year old patient presents to the office for a wellness check. She presented to the office 6 months ago for vaginal dryness, dyspareunia, and vaginal itchiness. She has been menopausal for 3 years now. She has no significant past medical history or family history. Her BMI is 22. Her clinician prescribed her topical estrogen cream. She states she does not want to continue using topical estrogen cream, as they are very messy, and she does not tolerate the smell. She is interested in other methods. What is the next best step in the management of this patient?

## Choices:

1. Advise her to use the vaginal cream anyway
2. Estradiol vaginal capsules
3. Estradiol vaginal ring
4. Hold vaginal cream for one week

## Answer: 3 - Estradiol vaginal ring

## Explanations:

- Estradiol vaginal rings are used as alternatives to vaginal estrogen cream if the patient does not enjoy using them.
- They are mess-free and can be removed at any time, thus making them a desirable alternative to creams.
- Estradiol vaginal rings can be inserted in the vagina for up to 90 days.
- Capsules can be uncomfortable for some patients, so this is contraindicated if the patient already does not want to use vaginal estrogen cream.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Estradiol

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## Question 310:

A 23-year-old female is brought to the emergency department by her boyfriend after an episode of sweating, headache, and altered mental status. The boyfriend reports he is unaware of a similar episode in the past. The patient works as an emergency nurse practitioner in one of the city's busiest hospitals. She drinks a glass of wine every other night and exercises regularly. The patient is afebrile, has a blood pressure of 110/65 mmHg, pulse of 121 beats per minute, and respiratory rate of 16 breaths per minute. An urgent finger stick blood glucose level of 57 mg/dl is recorded. More blood is drawn for further blood workup, and a 50% bolus of dextrose is administered, which improves the patient's symptoms drastically. Results from the blood workup show elevated levels of insulin, proinsulin, and C-peptide. A blood screening for an insulin secretagogue drug is positive. Which of the following is the mechanism of action of this suspected drug?

## Choices:

1. Inhibition of DPP-4 enzyme that deactivates GLP-1 leading to glucagon release, gastric emptying, and glucose-dependent insulin release
2. Activation of PPAR (a nuclear receptor) leading to an increase in insulin receptor sensitivity
3. Closure of K+ channels in the pancreatic B cell membrane leading to cell depolarizes and insulin release via Ca2+ influx
4. Inhibition of intestinal brush-border alpha-glucosidases leading to delayed carbohydrate hydrolysis and glucose absorption.

## Answer: 3 - Closure of K+ channels in the pancreatic B cell membrane leading to cell depolarizes and insulin release via Ca2+ influx

## Explanations:

- Factitious hypoglycemia caused by sulfonylureas or meglitinides biochemically mimics the insulinoma response because these drugs stimulate insulin secretion. Patients with insulinoma and insulin secretagogue-induced hypoglycemia can have plasma insulin, C-peptide, and proinsulin values above the normal levels.
- In such cases, the detection of sulfonylureas or meglitinides in the plasma confirms the diagnosis of factitious hypoglycemia.
- Sulfonylureas or meglitinides work by metabolization of glucose to produce ATP. This causes the closure of K+ channels in the pancreatic B cell membrane leading to cell depolarizes and insulin release via Ca2+ influx.
- In patients with elevated insulin levels who also have elevated levels of C-peptide, the source of insulin is endogenous, not exogenous.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Insulinoma

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## Question 311: A 72 year old male presents with erectile dysfunction (ED) and decreased libido. Laboratories show elevated FSH and LH with decreased total and free testosterone. Select the correct statement about treating this patient.

## Choices:

1. Testosterone supplementation will most likely improve his ED but not his libido
2. Testosterone supplementation will most likely improve his libido but may not improve his ED
3. Testosterone therapy is contraindicated in patients this age
4. No therapy is needed as these values are normal for his age

## Answer: 2 - Testosterone supplementation will most likely improve his libido but may not improve his ED

## Explanations:

- Testosterone levels peak late in adolescence or early adulthood.
- Many patients have low testosterone without decreased libido or erectile dysfunction (ED).
- Some patients develop ED, decreased libido, decreased muscle mass, and decreased bone mass.
- The patient is likely to have improvement in libido and muscle mass with testosterone supplementation, but ED can be multifactorial.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hypogonadism

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## Question 312:

A 40-year-old woman with a history of thyroid eye disease (TED) presents to the clinic for evaluation of bilateral ocular discomfort. The patient denies any previous orbital surgery. She was recently diagnosed with Graves disease. The patient feels her eyes are "bulging" more in the past three months than previously. Which of the following risk factors is most likely to exacerbate this patient's eye problem?

## Choices:

1. Diabetes mellitus
2. Hypertension
3. Smoking
4. Obesity

## Answer: 3 - Smoking

## Explanations:

- Smoking, uncontrolled thyroid dysfunction, and radioiodine therapy are risk factors for exacerbation of thyroid eye disease.
- Passive smoking may be a risk factor for the development of thyroid eye disease in childhood.
- Cigarette smoking may correlate with an increase in orbital venous congestion in thyroid eye disease.
- Euthyroidism must be achieved and maintained in the initial treatment of TED. Hypertension and obesity have no known direct assoication with TED.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Graves Disease Orbital Decompression

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## Question 313:

A 67-year-old man presents for follow up of a bone biopsy result. He has a past medical history of type 2 diabetes mellitus, well-controlled on medication, and end-stage renal disease (ESRD) on hemodialysis. The histopathologic results show cyst formation and numerous scattered hemosiderin-laden macrophages. Given the likely diagnosis, what cells are responsible for these bone changes?

## Choices:

1. Osteocytes
2. Osteoclasts
3. Osteoblasts
4. Periosteal fibroblasts

## Answer: 2 - Osteoclasts

## Explanations:

- Osteitis fibrosa cystica (OFC) is a skeletal condition secondary to an overproduction of parathyroid hormone (PTH) from the overactive parathyroid gland.
- This results in increased activity of osteoclasts that resorb bone and increase serum calcium.
- Osteitis fibrosa can cause bone pain or tenderness. There may be fractures in the arms, legs, or spine, or other bone problems. Problems due to hyperparathyroidism, like kidney stones and kidney failure.
- Osteoblasts form bone matrix and, when trapped, become osteocytes. Periosteal fibroblasts do not resorb bones.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Osteitis Fibrosa Cystica

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## Question 314:

A 43-year-old woman presents to the clinic with a chief complaint of pain behind her eye. On examination, she has asymmetric proptosis more prominent on the right eye, eyelid swelling and bilateral chemosis. The patient has Graves disease confirmed on lab testing. What is the best next step in the management of her eye problem?

## Choices:

1. Local measures and observe closely
2. Refer to ophthalmology for non-urgent follow up
3. Outpatient MRI of the brain and orbit
4. Admit to the hospital for MRI and IV steroids

## Answer: 4 - Admit to the hospital for MRI and IV steroids

## Explanations:

- Asymmetrical proptosis is an atypical presentation of Graves orbitopathy.
- Imaging is warranted in this patient for further investigation to help exclude other potential differentials for this atypical presentation of her eye disease.
- MRI of the brain including the orbit is a useful imaging modality as not only it can help to evaluate for possible other orbital differentials, but it can also distinguish clinically active disease and those patients who would likely respond to immunomodulatory drugs.
- After other problems are excluded, patients with active moderate-to-severe Graves orbitopathy should be evaluated for steroid therapy.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Graves Orbitopathy

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## Question 315:

A 67-year-old woman with a history of dyslipidemia and osteoporosis presents to the clinic to follow up regarding her cholesterol levels. She is currently taking high dose statin therapy, but her last serum cholesterol panel showed that her cholesterol levels were 156 mg/dL. Treatment with a drug that lowers cholesterol by depleting bile acids from the enterohepatic circulation is considered. The patient is also taking vitamin D and calcium for her osteoporosis. What is the most appropriate instruction for the patient regarding taking this medication?

## Choices:

1. Take all her medications at the same time
2. Take the vitamin D at least 4 hours before the new medication
3. Do not take the new medication with meals
4. Take the calcium at least 4 hours before the new medication

## Answer: 2 - Take the vitamin D at least 4 hours before the new medication

## Explanations:

- The mechanism by which bile acid sequestrants (BAS) reduce LDL-cholesterol involves malabsorption of bile acids in the intestine where it forms an insoluble complex, which is excreted in the feces.
- This causes the depletion of bile acids from the enterohepatic circulation. As bile acid levels decrease, more hepatic cholesterol is converted to bile acids due to disinhibition of cholesterol 7-alpha hydroxylase, the rate-limiting step in bile acid production. This results in a decrease in hepatic cholesterol and upregulation of hepatic LDL receptors culminating in a decrease in LDL-cholesterol levels.
- Bile acid sequestrants can interfere with fat-soluble vitamins, and therefore patients with fat-soluble vitamin deficiencies should avoid BAS use.
- If BAS are used with fat-soluble vitamins (vitamins A, D, E, and K), the vitamins should be taken more than 4 hours before cholestyramine. BAS should also be taken with meals.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Antilipemic Agent Bile Acid Sequestrants

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## Question 316:

A 45-year-old woman presents to her primary care provider with dysuria and malodorous urine. She has had type 2 diabetes mellitus for 2 years and is on dapagliflozin. For the past two weeks, she has tried a new diet. Her urine dipstick analysis is shown in the table below.

| | |
|---|---|
| Specific gravity | 1.021 |
| Blood | trace |
| Protein | trace |
| Leukocyte | 1+ |
| Glucose | 3+ |
| Ketone | 2+ |

Increased intake of which of the following nutrients is most likely responsible for the patient's condition?

## Choices:

1. Soluble fiber
2. Fat
3. Carbohydrates
4. Proteins

## Answer: 2 - Fat

## Explanations:

- A ketogenic diet primarily consists of high-fats, moderate-proteins, and very-low-carbohydrates.
- The ketogenic diet has placed this person in a ketotic state, causing ketones to be excreted in her urine.
- The patient has further been started on an SGLT-2 inhibitor, which increases the risk of urinary tract infection and in some patients causes euvolemic diabetic ketoacidosis.
- In a ketogenic diet, the dietary macronutrients are divided into approximately 55% to 60% fat, 30% to 35% protein, and 5% to 10% carbohydrates.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Ketogenic Diet

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## Question 317:

A 45-year-old female presents with anxiety and palpitations for the last few weeks. She has also been noticing heat intolerance. Her past medical history is significant for hypertension and diabetes mellitus type 2. Physical exam reveals a sweaty patient, with an enlarged neck. Bilateral tremors are noted in her hands. Laboratory tests are significant for TSH 0.1 microunit/mL (normal 0.5-5.0), FT4 2.1 ng/dL (normal 0.7-1.8), and FT3 500 pg/dL (normal 260-480). The clinician prescribes some medications and schedules the patient for I-123 radioactive iodine uptake (RAIU) and scan. Which of the following should be discontinued before the test?

## Choices:

1. Propranolol
2. Methimazole
3. Multivitamin
4. Verapamil

## Answer: 2 - Methimazole

## Explanations:

- Antithyroid medications, including methimazole, carbimazole, and propylthiouracil, should be held before I-123 radioactive iodine uptake (RAIU) and scintigraphy.
- Thyroid hormone replacement medications should also be held.
- Diets rich in iodine, such as kelp or seaweed, iodinated contrast agents, and medications with iodine such as amiodarone should be held prior to I-123 RAIU as they may reduce sensitivity.
- Beta-blockers, such as propranolol, are usually used to block the adrenergic tone seen in thyroid storm but do not have a noticeable effect on I-123 RAIU.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### I-123 Uptake

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## Question 318:

A 65-year-old male patient presents to the hospital with a complaint of pain and swelling in his wrist joint that started an hour ago. The pain started after he fell on his outstretched hand. On further questioning, he reveals that this pain is aggravated by movement of the wrist. A detailed medical history reveals that he had a renal transplant a year ago and was also diagnosed as a case of achalasia cardia three years ago. His vital signs are stable. An examination of the wrist joint reveals a dinner-fork deformity. An x-ray is performed which reveals a fracture of the distal radius along with thin cortices of the bone. His fracture has been stabilized by applying a cast. What is the most appropriate pharmacological management of his condition?

## Choices:

1. Bisphosphonates
2. Teriparatide
3. Denosumab
4. Calcium

## Answer: 2 - Teriparatide

## Explanations:

- This clinical vignette is most consistent with osteoporosis secondary to corticosteroid intake. Corticosteroids are given to patients with renal transplants to prevent graft rejection. In osteoporosis, there is low bone density leading to an increased risk of fractures.
- Teriparatide is used in the treatment of glucocorticoid-induced osteoporosis where bisphosphonate therapy is either contraindicated e.g achalasia or not proven to be beneficial. Teriparatide is not used as a first-line drug.
- Teriparatide 20 micrograms daily are given via subcutaneous injection. It is a recombinant human parathyroid hormone.
- Bisphosphonates are contraindicated in achalasia. Denosumab is usually used in cases of osteoporosis secondary to malignancies. Calcium supplements can be in osteoporosis to maintain serum calcium levels.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Secondary Osteoporosis

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## Question 319: A 65-year-old lady presents to her primary care provider for a follow-up visit. She has a history of type 2 diabetes mellitus and was recently started on a 25/75 insulin/Neutral protamine Hagedorn (NPH). Her physical examination is normal. Her fasting blood sugar is 80 mg/dl, glycated hemoglobin (HbA1c) is 7.2%. Her provider advises her to continue with the treatment. Which of the following is the advantage of using a 25/75 insulin/NPH combination?

## Choices:

1. Slow onset, short duration
2. Slow onset, long duration
3. Fast onset, short duration
4. Fast onset, long duration

## Answer: 4 - Fast onset, long duration

## Explanations:

- The regular insulin is rapid-acting, and the neutral protamine Hagedorn (NPH) is long-acting.
- Regular insulin has an onset of 30 minutes to one hour, peaks at two to four hours, and has a duration of six to eight hours.
- NPH insulin has an onset of one to two hours, peaks at six to ten hours, and has a duration of more than 12 hours.
- Using the combination, 75% NPH, and 25% insulin Lyspro ratio provide better glycemic control.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### NPH Insulin

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## Question 320:

A 15-year-old boy is brought to the clinic for evaluation. His father looks frustrated and complains about him being clumsy and lazy. The boy reports "no motivation for physical activities." On further questioning, he describes muscle pains and spasms on very little exercise. He also reports episodes of dark-colored urine after playing soccer with his family. Physical examination shows normal development and neurological examination is insignificant. Baseline laboratory tests show a high serum creatinine kinase and myoglobin level. Urinalysis confirms myoglobinuria. Which of the following is the most appropriate advice for this patient?

## Choices:

1. A carbohydrate-containing drink before exercise
2. Protein-rich diet
3. Avoiding fasting
4. High-calorie granola bars during exercise

## Answer: 1 - A carbohydrate-containing drink before exercise

## Explanations:

- McArdle disease is a glycogen storage disease which results in disrupted glycogen metabolism. It is caused by the deficiency of enzyme glycogen phosphorylase. A sucrose-containing drink taken 45 minutes before exercise improves exercise capacity and helps to lessen the undesirable symptoms.
- Symptoms are often appreciable after exercise and include muscle cramps, muscle pain, and rarely contractures. Rhabdomyolysis episodes are common after intense physical activity. Patients usually self-adjust to the disease by avoiding activities that exacerbate the symptoms, for example, avoiding contact sports.
- Labs show chronically high serum CK and myoglobin. Urinalysis shows myoglobinuria. Diagnosis is confirmed by muscle biopsy and genetic sequencing. The most common mutations are R50X in white patients.
- A protein-rich diet is usually not helpful because the primary abnormality is related to carbohydrate metabolism. Similarly, avoiding fasting and eating high-calorie granola bars also provides little benefit.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### McArdle Disease

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## Question 321:

A 65-year-old man with a history of nicotine dependence and chronic cough presents to the clinic with hemoptysis, night sweats, and lethargy that started 6 months ago. He also reports weight loss. He takes no medications. Physical exam reveals a very lethargic patient, but vital signs are unremarkable. An initial set of investigations is shown below.

| | Patient value | Reference range |
|---|---|---|
| Hemoglobin | 14 g/dL | 13.2-17.5 g/dL |
| Serum creatinine | 1.9 mg/dL | 0.8-1.4 mg/dL |
| Magnesium | 2.0 mg/dL | 1.8-3.0 mg/dL |
| Calcium | 12 mg/dL | 8.5-10.2 mg/dL |
| Albumin | 3.7 g/dL | 3.5-5 g/dL |
| Parathyroid hormone | 17 pg/mL | 14-65 pg/mL |

Which of the following is the next best step in the management of this patient?

## Choices:

1. Computer tomography of the chest, abdomen, and pelvis
2. Parathyroid hormone-related peptide (PTHrP) level
3. Oral azithromycin
4. Bronchoalveolar lavage

## Answer: 2 - Parathyroid hormone-related peptide (PTHrP) level

## Explanations:

- The next diagnostic step is to obtain a parathyroid hormone-related peptide level for this patient. The major mechanisms responsible for malignancy-related hypercalcemia include overproduction of PTHrP by the tumor, osteolytic metastatic disease, and the ectopic activity of 1-alpha hydroxylase.
- These mechanisms lead to overproduction of 1,25-dihydroxy cholecalciferol, ectopic PTH production by parathyroid and extra parathyroid malignancies, and excess serum calcium secondary to paraprotein binding.
- PTHrP enhances calcitriol (1,25- dihydroxyvitamin D) production, stimulates osteoclastic activity, facilitates renal calcium reabsorption, and decreases renal phosphate reabsorption thereby, elevating calcium levels.
- Obtaining a computer tomography of the chest, abdomen, and pelvis is reasonable when screening for possible malignancy-related hypercalcemia. However, it is always advisable to perform first laboratory testing in stable patients when applicable before proceeding to imaging studies. The patient's symptoms have been ongoing for 6 months. Therefore, there is very low suspicion for an infectious process. Tuberculosis can present with hemoptysis and weight loss; however, this will not be treated before testing and confirmation of infection. Bronchoalveolar lavage will not be the first step in diagnosing malignancy-related hypercalcemia.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Resistant Hypercalcemia

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## Question 322:

A 20-year-old G1P1001 female has a complaint of weight gain, which is mostly in the lower extremities. This worsened after her pregnancy. She has been exercising 6 days a week, following a low-calorie diet, and has been treated with diuretics and knee-high stockings. The condition has not improved. The thighs are tender on palpation. Her waist circumference is normal, and her BMI is 27 $kg/m^2$. The lower extremities have palpable fatty tissue that feels like round peas. Which of the following additional findings is most likely to be present in this patient?

## Choices:

1. Marked pitting edema
2. Hyperpigmentation of the lower legs
3. Positive cuff sign
4. Achilles tendon xanthomas

## Answer: 3 - Positive cuff sign

## Explanations:

- Cuff sign occurs due to fat tissue overhanging minimally involved feet. It is seen in lipedema. The patient's presentation is classic for lipedema, where abnormal fat deposition in the lower extremities is seen.
- The condition is familial. It most commonly is seen in women aged between 15 to 30. There is soft and minimal pitting edema with palpable "round peas."
- Treatment involves pain management, lymphatic decongestive therapy, and potentially liposuction.
- In contrast, lymphedema, a lymphatic pathology, is characterized by marked pitting edema.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Lipodystrophies

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## Question 323:

A 32-year-old man presents to the hospital with complaints of weight gain despite a restricted diet and episodes of lightheadedness and sweating for the past six months. The episodic events of sweating and lightheadedness have increased in frequency over the past four months. The patient also admits to blurred vision during these episodes. Each episode lasts for about 5 to 10 minutes and improves after the patient eats a quick snack. He drinks red wine once a month and does not smoke. He does not take any medication, and his family history is unremarkable. His blood pressure is 130/85 mmHg, and his pulse is 82/min and regular. Physical examination is within normal limits. What is the best next step in the management of this patient's condition?

## Choices:

1. Measurement of plasma fractionated metanephrine levels during the episodes
2. Measurement of cortisol levels during the episodes
3. Measurement of thyroid-stimulating hormone during the episodes
4. Measurement of patient's blood glucose levels during the episodes

## Answer: 4 - Measurement of patient's blood glucose levels during the episodes

## Explanations:

- Insulinomas are predominantly derived from pancreatic islet cells. It is a neuroendocrine tumor that produces insulin in excess. The hormones may be secreted in short bursts resulting in fluctuations of blood glucose. Presenting complaints in about 85% of patients are episodic blurred vision, diplopia, sweating, weakness, and palpitations.
- The combination of weight gain and hypoglycemia makes it important to investigate insulinoma as a potential culprit. The best next step is measuring blood glucose levels during the episodes.
- Only 10% of insulinomas are malignant. Normally insulin and C-peptide are secreted in equal quantities as they are products of proinsulin. Some insulinomas also secrete gastrin, ACTH, 5-hydroxyindole acid, hCG, and somatostatin.
- Hyperthyroidism can cause symptoms of episodic sweating, blurred vision, and palpitations but it would not explain the weight gain and resolution of symptoms after having a snack.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Insulinoma

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## Question 324: A 45-year-old male with a history of type 2 diabetes presents to the clinic complaining of a 2-week history of episodic tremor, palpitations, nausea, and loss of consciousness. Her blood pressure is 140/90, respiratory rate is 18 breaths per minute, heart rate is 76 beats per minute, and her temperature is 36.8 Celsius. Physical examination findings are unremarkable. The patient has a past medical history of hypertension and coronary heart disease in addition to her type 2 diabetes. She is currently taking metformin, atorvastatin, glimepiride, and ramipril. Her HbA1c is 52 mmol/mol. What is the mode of action of the drug that is causing her symptoms?

## Choices:

1. Inhibits the breakdown of dipeptidyl peptidase-4 inhibitor.
2. Blocks ATP-dependent K+ channels on pancreatic beta cells.
3. Increases the sensitivity of insulin via cAMP-mediated mechanisms.
4. Inhibits the sodium-glucose linked transporters in the proximal convoluted tubule to increase glucose excretion.

## Answer: 2 - Blocks ATP-dependent K+ channels on pancreatic beta cells.

## Explanations:

- Glimepiride is in the sulphonylurea class of hypoglycemic agents.
- By inhibiting potassium channels, glimepiride triggers depolarization and activation of voltage-gated calcium channels which trigger insulin exocytosis.
- Excess insulin release via glimepiride can trigger hypoglycemia which causes both autonomic (palpitations, tremor, nausea) and neuroglycopenic (headache, dizziness, coma) symptoms.
- The insulin released through glimepiride action is endogenous, thus a functioning pancreatic beta cell is required.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Glimepiride

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## Question 325:

A 29-year-old male has been training to lose weight over the course of one month. He chose to undergo intermittent fasting as his weight loss strategy, stating he has lost six pounds to date. He complains that he feels an increase in hunger recently and is having difficulty staying within his daily calorie restriction. Biologically, this can be explained by which one of the following?

## Choices:

1. Decreased PYY and ghrelin levels, increasing NYP release
2. Increased GLP-1 and ghrelin levels, increased POMC release
3. Decreased GLP-1 and leptin levels, reducing POMC release
4. Increased ghrelin and leptin levels, increasing NYP release

## Answer: 3 - Decreased GLP-1 and leptin levels, reducing POMC release

## Explanations:

- Leptin is known as a satiety hormone, often viewed as working "opposite" of ghrelin. Ghrelin is known as the "hunger" hormone. In patients with increased hunger, ghrelin levels are typically elevated, while leptin levels are decreased.
- Glucagon-like peptide-1 (GLP-1) is naturally secreted after food intake, ultimately working to increase satiety levels.
- Proopiomelanocortin (POMC) is converted and acts centrally to reduce dietary intake.
- It is important to understand hormone changes depending on the current physical state. Several hormones work in unison with one another, while others have inverse relationships. Understanding these relationships can help better understand and develop treatment strategies.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Management Of Weight Loss Plateau

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## Question 326:

A 35-year-old female patient presents to the hospital complaining of amenorrhea, abdominal pain, and distension for a few weeks. She further reports dyspnea on exertion, loss of libido, and change in skin color for the past six months. On examination, she appears to be tanned; there is mild peripheral edema and hepatomegaly; however, the remainder of the examination is unremarkable. Her past medical history is significant for NSAIDs use for the relief of arthralgias and insulin for the management of diabetes mellitus. Two-dimensional transthoracic echocardiography reveals a concentric thickening of the left ventricular free wall and septum. Her laboratory investigations reveal a normal count of beta HCG; however, the transferrin saturation is 95%. Abnormality of which of the following is associated with this disorder?

## Choices:

1. Ceruloplasmin
2. Amyloid
3. Hepcidin
4. Ferritin

## Answer: 3 - Hepcidin

## Explanations:

- This patient seems to be having hemochromatosis complicated by excess iron deposition in different organ systems. Organs affected by hemochromatosis include the liver, pancreas, heart, thyroid, joints, skin, gonads, and pituitary.
- Hepcidin is a regulator of iron metabolism, and iron overload is known to occur when hepcidin is deficient. In many other types of iron overload, hepcidin levels are normal.
- The liver produces hepcidin, and it determines how much iron is absorbed from the diet and released from storage sites in the body. The normal function of the HFE gene appears to be the control of iron uptake by cells through its interaction with the transferrin receptor.
- The conventional therapy for primary hemochromatosis is phlebotomy. Patients may require 50 to 100 phlebotomies of 500 mL each to reduce iron levels to normal. Phlebotomy is usually performed once or twice a week. Once iron levels have normalized, lifelong but less frequent phlebotomy (typically 3-4 times a year) is required. The objective is to obtain a ferritin level of less than 50 mcg/L.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hemochromatosis

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## Question 327:

A 39-year-old woman with a history of Hashimoto thyroiditis and type 1 diabetes presents to the hospital with abdominal pain, nausea, and early satiety. On further questioning, she has not been very compliant with her medications.; Laboratory values show elevated transaminases and normal alkaline phosphatase. Ultrasound of the abdomen shows hepatomegaly with possible fatty infiltration. She undergoes a liver biopsy, which shows enlarged hepatocytes. With diastase treatment of PAS stain, the cells appear empty and "ghost-like." Which of the following is the most appropriate management strategy for this patient?

## Choices:

1. Weight loss
2. Better control of diabetes
3. Low-fat diet
4. Thyroid function tests

## Answer: 2 - Better control of diabetes

## Explanations:

- Glycogenic hepatopathy remains underdiagnosed and underreported abnormality of the liver in patients with diabetes. Most clinicians mistake the abnormality as NAFLD.
- Excess of glycogen accumulates in the liver with poorly controlled diabetes patients, causing hepatomegaly and elevated transaminases.
- Adequate control of diabetes results in complete resolution of symptoms and signs of glycogenic hepatopathy.
- The biopsy of the liver shows enlarged hepatocytes due to the accumulation of glycogen in the cytoplasm.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Glycogenic Hepatopathy

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## Question 328: A 27-year-old man presents to the clinic with bilateral shoulder pain for the past six months. He has a history of type 1 diabetes mellitus and takes insulin. On examination, multiple subcutaneous tender swellings are palpated on the anterior and lateral aspects of both shoulders. His serum phosphate level is 10 mg/dL, and 1,25 hydroxyvitamin D level is 45 pg/mL (reference range: 25-65 pg/mL). Which of the following disease processes is most likely responsible for this patient’s condition?

## Choices:

1. FGF23 gene mutation
2. GALNT3 gene mutation
3. KL gene mutation
4. Autoantibodies against FGF23

## Answer: 4 - Autoantibodies against FGF23

## Explanations:

- The patient most likely has hyperphosphatemic tumoral calcinosis.
- Four patterns of the disease have been described – a) deficiency of FGF23 levels due to mutation in FGF23 gene, b) pathological inactivation of FGF23 due to defect in its O-glycosylation as a result of a mutation in GALNT3 gene, c) resistance to FGF23 due to mutation in KL gene encoding its co-receptor KLOTHO protein, and d) autoimmunity against FGF23.
- The one with autoantibodies against FGF23 has been reported to be associated with type 1 diabetes mellitus.
- The other three types have autosomal recessive inheritance, while the autoimmune type is acquired.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hyperphosphatemic Tumoral Calcinosis

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## Question 329: A 45-year-old male comes to the clinic for an evaluation of the increased frequency of urination and drinking more water than usual for the past few weeks. The patient has a significant family history of diabetes mellitus in his father. Which of the following disease states render a fructosamine assay unreliable in assessing diabetes control?

## Choices:

1. Sickle cell disease
2. Iron deficiency anemia
3. Vitamin B12 deficiency anemia
4. Hepatic cirrhosis with ascites

## Answer: 4 - Hepatic cirrhosis with ascites

## Explanations:

- Fructosamine assay is useful when there is hemoglobinopathies or altered red blood cell turnover.
- Fructosamine largely measures glycated proteins, mainly albumin, and is unreliable with cirrhosis with hypoalbuminemia and ascites.
- Iron deficiency anemia alters red blood cell turnover.
- Fructosamine is unreliable in nephrotic syndrome.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Fructosamine

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## Question 330:

A 57-year-old Hispanic man with a history of hypertension, stroke, and residual left-sided hemiparesis presents to the clinic for follow up. He currently takes atorvastatin 80 mg, hydrochlorothiazide 25 mg, lisinopril 25 mg, and aspirin 81 mg. His lab studies show sodium 137mEq/L, potassium 4.5mEq/L, BUN 20 mEq/L, creatinine 1.1 mg/dL, glucose 92 mg/dL, calcium 9 mg/dL, total cholesterol 232 mg/dL, LDL 150 mg/dL, triglycerides 200 mg/dL, AST 32 U/L, ALT 34 U/L, and ALP 40 IU/L. Which of the following is the next best step in the management of this patient?

## Choices:

1. Evolocumab
2. Fenofibrate
3. Niacin
4. Cholestyramine

## Answer: 1 - Evolocumab

## Explanations:

- For patients with inadequate LDL-C control with a high-intensity statin, an add on hypolipidemic agent has to be initiated. Evolocumab reduces LDL-C to 50% and can be started here.
- PCSK9 inhibitors alirocumab and evolocumab have shown a significant decrease in LDL cholesterol levels.
- Niacin is most effective for raising HDL-C.
- Fenofibrate decreases triglycerides more than LDL. Cholestyramine interferes with other drugs for absorption and has adverse side effects like abdominal discomfort, diarrhea, flatulence.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Polygenic Hypercholesterolemia

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## Question 331:

A 26-year-old man presents to the emergency department with acute onset of lower abdominal and back pain. He takes calcium and calcitriol for chronic hypoparathyroidism. For the past 5 years, his serum calcium, albumin, and phosphorus levels have been normal on this treatment regimen. He has microscopic hematuria on a urinalysis. Which of the following tests is most likely to reveal the etiology of his acute symptoms?

## Choices:

1. Serum calcium
2. Ultrasound of the gallbladder
3. Serum lipase
4. CT of the abdomen without contrast

## Answer: 4 - CT of the abdomen without contrast

## Explanations:

- Patients treated for chronic hypoparathyroidism with calcium and calcitriol are at an increased risk of developing urolithiasis.
- These risks of urolithiasis can be minimized by titrating therapy to keep the serum calcium level in the low-normal range.
- The absence of PTH reduces the renal tubular reabsorption of calcium, predisposing patients with hypoparathyroidism to develop urolithiasis.
- In patients treated for hypoparathyroidism, urine calcium should periodically be measured to make sure that patients do not develop hypercalciuria. Urine calcium excretion of greater than 200-250 mg/24 hours should alert the physician to reduce the dose of calcium or calcitriol. Another option is to add a thiazide diuretic.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hypoparathyroidism

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## Question 332: A 72-year-old man presents to the emergency department with complaints of blood in his urine. He denies flank pain or dysuria. He has a 60-pack-year smoking history and long-term type 2 diabetes that is well-controlled with pioglitazone and insulin detemir. He has lost 12 pounds (5.4 kg) over the last six months. Urinalysis shows hematuria without casts. What is the next best step in the management of his diabetes?

## Choices:

1. Add sulfonylureas
2. Switch to rapid-acting insulin
3. Switch pioglitazone to an alternative oral medication
4. No change in his diabetic treatment

## Answer: 3 - Switch pioglitazone to an alternative oral medication

## Explanations:

- Some research indicates that long-term use of thiazolidinediones may be linked to bladder cancer.
- Bladder cancer, as seen in this patient with painless hematuria and extensive smoking history, are absolute contraindications to thiazolidinedione therapy.
- Therefore the appropriate management would be to stop this medication and find an alternative therapy for glycemic control.
- Sulfonylureas may help the patient gain weight back, but it is important to discontinue thiazolidinediones in patients with active bladder cancer. There is no indication for changing insulin due to bladder cancer.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Thiazolidinediones

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## Question 333:

A 50-year-old man presents with complaints of progressive headache, vision disturbance, and back pain for the past three months. He has enlarged, swollen hands and feet, coarse facial features, frontal bossing, and enlarged jaw on physical examination. Laboratory investigation reveals an elevated IGF-1 level and his growth hormone level is less than 1 ng/mL after a 75 gram glucose tolerance test. Which of the following is the treatment of choice for the suspected condition?

## Choices:

1. Octreotide
2. Bromocriptine
3. Pegvisomant
4. Transsphenoidal surgery

## Answer: 4 - Transsphenoidal surgery

## Explanations:

- The signs and symptoms along with the laboratory findings in this patient are suggestive of acromegaly.
- Surgery is the treatment of choice for all microadenomas and macroadenomas causing a mass effect.
- There are two main types of surgical techniques: endoscopic transsphenoidal surgery and transsphenoidal microscopic surgery.
- The goals of acromegaly treatment include normalizing biochemical parameters (growth hormone and IGF-1 levels); reducing or eliminating associated signs and symptoms; reducing or eliminating any local mass effect of the tumor; managing comorbidities; increasing lifespan.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Acromegaly

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## Question 334:

A 12-year-old boy is brought to the clinic with progressive fatigue. He was previously diagnosed with type 1 diabetes. His vital signs show pulse 98/min, respiratory rate 18/min, blood pressure 140/85 mmHg, temperature 37.2 C, and oxygen saturation 98% breathing room air. His hemoglobin is 10 g/dL, total serum bilirubin 2.4 mg/dL, indirect bilirubin 1.6 mg/dL and mean corpuscular volume 80 fL. Serum lactate dehydrogenase is 400 U/L. Clinical examination reveals icteric sclerae, splenomegaly, and hepatomegaly. His younger sister has similar symptoms. What is the likely mode of inheritance of this disease?

## Choices:

1. Sporadic mutation
2. Autosomal dominant
3. X-linked dominant
4. Autosomal recessive

## Answer: 4 - Autosomal recessive

## Explanations:

- Pyruvate kinase deficiency (PKD) causes hemolytic jaundice, splenomegaly, and anemia.
- It follows an autosomal recessive inheritance pattern.
- Both males and females may be affected.
- G6PD deficiency is inherited as an X-linked recessive. Sporadic mutations may cause G6PD deficiency. Autosomal dominant inheritance occurs in hereditary spherocytosis. X-linked dominant inheritance characterizes fragile X syndrome.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Pyruvate Kinase Deficiency

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## Question 335:

A 29-year-old lady presents to the outpatient department with a complaint of amenorrhea for the past two months. A urine pregnancy test is negative. After gynecological evaluation, she undergoes a magnetic resonance imaging of the brain, which shows a pituitary macroadenoma with para sellar extension bilaterally. Her prolactin level is 510 ng/ml. She is started on bromocriptine, and her menstruation returns two months after initiating therapy. Of the following, which best describes the mechanism of action by which bromocriptine achieves this therapeutic effect in this patient?

## Choices:

1. Stimulates the release of luteinizing hormone
2. By acting as a dopamine D2 receptor antagonist
3. Inhibiting prolactin release
4. Acting as an estrogen receptor antagonist

## Answer: 3 - Inhibiting prolactin release

## Explanations:

- One of the pituitary causes of amenorrhea is hyperprolactinemia.
- As a dopamine D2 receptor agonist, bromocriptine inhibits prolactin release.
- It is also an agonist at various serotonin receptors and inhibits glutamate release.
- Bromocriptine is used in the treatment of prolactinoma, Parkinson disease, and type 2 diabetes.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Bromocriptine

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## Question 336:

A 74-year-old woman is brought into the hospital for nausea vomiting and lethargy. She has a history of pancreatic cancer with distant metastasis, diabetes, hypertension, and hyperlipidemia. She takes Long and short-acting insulin and has missed a few doses due to abdominal pain. She is found to be in diabetic ketoacidosis (DKA) and receives intravenous insulin with a resolution of the DKA. She receives intravenous morphine sulfate for her abdominal pain and reports an improvement in her pain. However, she complains of a burning sensation of her feet, going up from her toes to midcalf level. Which of the following is the next best step in the management of this patient?

## Choices:

1. Add intravenous ketorolac
2. Increase the dose of morphine sulfate by 25%
3. Switch morphine sulfate to oxycodone
4. Add gabapentin

## Answer: 4 - Add gabapentin

## Explanations:

- Antiepileptic medications like gabapentin and pregabalin can be used for pain from neuropathy and bony metastasis.
- Both these medications require dose adjustments for renal impairment.
- Gabapentin can help the pain from diabetic neuropathy, which follows a glove and stocking pattern.
- Nonopiate medications can be used as an adjunct to opiates or NSAIDs for pain management.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### End Of Life Evaluation And Management Of Pain

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## Question 337:

A 55-year-old woman presents to the office with complaints of low-grade fever, night sweats, and increased urination over the past 15 days. She also has mild constipation, a decrease in appetite, and bone pain. She further states that she is irritated easily, and she is not able to focus on her work. Because of this behavior, she was fired from her job. Her past medical history is significant for diabetes mellitus for 10 years, well-controlled with medications. She visits her clinician regularly, and her blood sugar is under control. On physical examination, a mobile mass is palpable in the right mandible with a palpable lymph node. Her temperature is 36.7 C, blood pressure 130/70 mmHg, and heart rate 82/min. Current laboratory results reveal glucose 120 mg/dL, HbA1c 5.5%, serum calcium 20 mg/dL, urine calcium 270 mg, serum creatinine 1.2 mg/dL, and serum sodium 137 mEq/L. What is the most likely cause of her symptoms?

## Choices:

1. Increase in the parathyroid hormone in the blood
2. Increase parathyroid hormone-related protein (PTHrP) in the blood due to malignancy
3. Renal failure due to diabetes mellitus
4. Mutations in the calcium-sensing receptor in parathyroid and kidney

## Answer: 2 - Increase parathyroid hormone-related protein (PTHrP) in the blood due to malignancy

## Explanations:

- Non–Hodgkin lymphoma presents with systemic B symptoms (low-grade fever, night sweats, weight loss), and painless peripheral lymphadenopathy in up to two-third patient.
- Hypercalcemia due to non-Hodgkin lymphoma is due to increase parathyroid hormone-related protein (PTHrP) or 1,25-dihydroxycholecalciferol (calcitriol).
- Symptoms of hypercalcemia include agitation, constipation, and increased urination. The serum calcium level can rise to 21 mg/dL.
- Urine calcium rises above 250 mg in hypercalcemia due to malignancy.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Non-Hodgkin Lymphoma

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## Question 338:

A 43-year-old male with a past medical history of atrial fibrillation (on warfarin), hypertension, and gastroesophageal reflux presents to the office for a three month follow up visit. Labs drawn after the visit are significant for an HbA1c of 8.1%. He is prescribed metformin 500 mg twice daily. The following day, the patient calls the office, stating he would like to try milk thistle as he read online that it can potentially lower blood glucose levels. Which of the following side effects is most likely to occur if this patient takes milk thistle?

## Choices:

1. Lactic acidosis
2. Diarrhea
3. Hepatotoxicity
4. Hyperbilirubinemia

## Answer: 2 - Diarrhea

## Explanations:

- When reported, side effects for milk thistle are generally gut disturbances like diarrhea, nausea or bloating.
- Vomiting and watery diarrhea can occur within five to 12 hours of ingestion.
- Most suggest taking milk thistle along with food to maximize absorption and limit side effects.
- Milk thistle does not cause hepatoxicity if taken in normal doses and does not increase serum level of metformin.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Milk Thistle

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## Question 339: A 65-year-old male with a known history of autoimmune hypothyroidism and stable thyroid-stimulating hormone (TSH) for many years on levothyroxine presents with complaints of dysphagia, hoarseness, and neck pain for the past two weeks. On physical examination, the thyroid gland is hard and fixed with minimal tenderness. Which of the following is the most likely cause of this patient's presentation?

## Choices:

1. Infectious thyroiditis
2. Thyroid lymphoma
3. Reidel thyroiditis
4. Papillary carcinoma

## Answer: 2 - Thyroid lymphoma

## Explanations:

- Hashimoto thyroiditis is the only identified risk factor for thyroid lymphoma.
- Thyroid lymphoma should be considered in any patient with Hashimoto thyroiditis who presents with sudden enlargement of the thyroid gland and symptoms of compression like dysphagia or dyspnea.
- The thyroid gland on the exam is usually firm, enlarged, fixed, and immobile with swallowing. Thyroid lymphoma should be considered in any patient with a history of Hashmito presenting with an enlarging goiter.
- Ultrasound followed by fine-needle aspiration with flow cytometry or excisional biopsy is the diagnostic test of choice.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Thyroiditis

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## Question 340:

A 48-year-old woman is referred to the hospital from her primary care provider's office for the management of high blood pressure, which is unresponsive to therapy. She has a history of neurofibromatosis type 1, though without any neurological deficits. She has multiple café-au-lait spots on her body. She is found to have a blood pressure of 168/128 mmHg. Her 24-hour urine metanephrines and vanillyl mandelic acid (VMA) come back elevated. Her abdominal CT shows a 2cm adrenal mass. It is decided that the patient needs surgery; however, she needs to have her blood pressure under control. What is the best medication for use prior to surgery?

## Choices:

1. Clonidine
2. Propranolol
3. Captopril
4. Phenoxybenzamine

## Answer: 4 - Phenoxybenzamine

## Explanations:

- This patient likely has a pheochromocytoma. The drug of choice in this patient is phenoxybenzamine, which is a nonspecific, irreversible alpha antagonist.
- It is used before and during surgery to lower blood pressure in patients with pheochromocytoma.
- It is important to treat with an alpha-blocker prior to a beta-blocker as beta-blocker therapy alone will lead to unopposed alpha stimulation, resulting in a hypertensive crisis similar to that seen with cocaine intoxication.
- It is also used off-label to treat thyrotoxicosis.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Chromaffin Cell Cancer

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## Question 341:

A 65-year-old female patient presents for the first time in the hospital. Her past medical history is notable for a 15-year history of type 2 diabetes and hypertension, as well as a history of myocardial infarction three years ago. Her current list includes hydrochlorothiazide 25 mg daily, valsartan 320 mg daily, metoprolol succinate 50 mg daily, metformin 850 mg twice a day, atorvastatin 40 mg daily, and aspirin 81 mg daily. On examination, she has a blood pressure of 136/78 mmHg and a heart rate of 65 beats/min. Laboratory findings include an HbA1C of 8.2%, LDL-cholesterol level of 70 mg/dL, HDL-cholesterol level of 38 mg/dL, serum triglyceride level of 215 mg/dL, and an estimated glomerular filtration rate of 85 mL/min/1.73 m2. Which of the following medications has shown to reduce cardiovascular risks in this patient?

## Choices:

1. Glipizide
2. Liraglutide
3. Niacin
4. Insulin

## Answer: 2 - Liraglutide

## Explanations:

- Since the year 2008, the FDA has required the newly approved diabetes medications to undergo investigation for cardiovascular safety. Insulin and sulfonylureas do not seem to have any cardiovascular benefits.
- Metformin does not have any adverse cardiovascular benefits, and it appears to decrease cardiovascular events.
- The LEADER trial demonstrated the cardiovascular advantage of liraglutide. Semaglutide also has favorable cardiovascular benefits.
- Niacin was a consideration in the past in the effort to raise HDL and lower triglycerides. Still, use was questioned after the AIM-HIGH Trial (Atherothrombosis Intervention in Metabolic Syndrome with Low HDL/High Triglycerides: Impact on Global Health Outcomes), which failed to show any clinical benefit from adding Niacin to a patient to a statin in a patient with known coronary artery disease history.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Diabetes Mellitus

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## Question 342: A 54-year-old woman presents to the clinic after undergoing a sleeve gastrectomy procedure. Her BMI was 43 $kg/m^2$ preoperatively and is 41 $kg/m^2$ six months later. She has a history of hypertension and was diagnosed with breast cancer two weeks ago. She has been attending her follow-up appointments but admits to feeling low in mood, with a lack of enjoyment, and lack of energy. She continues to have a job as a dog-walker. Her weight loss is less than expected. Which of the following is the strongest risk factor for her less than expected results?

## Choices:

1. Depressive disorder
2. Her employment
3. Hypertension
4. Breast cancer

## Answer: 1 - Depressive disorder

## Explanations:

- Binge eating disorders, depressive disorders, and uncontrolled snacking are associated with poorer weight loss outcomes following surgery. The vignette suggests this patient is suffering from low mood, anhedonia, and anergia, making depression the most likely contributing factor.
- Weight regain is particularly noted following sleeve gastrectomy.
- Weight loss can be reduced or prevented following restrictive surgery with the use of high-calorie low-volume foodstuffs such as milkshakes and ice cream.
- Neither hypertension nor breast cancer would explain her poor weight-loss outcomes. Her employment suggests that she is physically active, and therefore this is not the most likely contributing factor.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Counseling Patients On Bariatric Surgery For Obesity

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## Question 343:

A 69-year-old woman presents to the office for establishing care after moving from out of town. A review of records shows that she was diagnosed with Hurthle cell thyroid cancer 4 years ago, for which had a thyroidectomy done. Imaging reports from 3 years ago shows metastases to right cervical lymph nodes and lungs. She states that she has not had any treatment done besides thyroid surgery because of socioeconomic issues. She reports poor appetite and intermittent tiredness on exertion. She denies any weight loss or other symptoms. Her BMI is 27 kg/m2. A current set of labs shows hemoglobin, white blood cell count, platelet count, and serum chemistries within normal limits. CT scan of neck, chest, abdomen, and pelvis shows right cervical lymphadenopathy and pulmonary nodules, which appear to be similar in number as noted on reports from her scans 3 years ago but with a few nodules now larger in size by 2-6 mm. MRI of the brain does not show any evidence of metastatic disease. Which of the following is the next best step in the management of this patient?

## Choices:

1. Reassurance and routine follow-up
2. Radioiodine imaging scan
3. Cervical neck dissection followed by systemic therapy
4. Lenvatinib

## Answer: 1 - Reassurance and routine follow-up

## Explanations:

- Monitoring of disease and observation is perfectly acceptable in patients with differentiated metastatic Hurthle cell thyroid carcinoma with seemingly indolent disease and no cancer or metastases related symptoms.
- Asymptomatic brain metastases would, however, need to be treated with radiation therapy.
- RAI imaging would be the next step if the patient gets symptomatic or has a rapidly progressing disease to see if she can get RAI therapy.
- Lenvatinib would be the drug of choice if the patient has an indication for treatment and her disease is not Iodine avid.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hurthle Cell Thyroid Carcinoma

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## Question 344:

A 33-year-old male presents to the emergency room for a cough, persistent vomiting, and back pain of 1-month duration, which acutely worsened, including new-onset encephalopathy three hours ago. While triaging, the patient had a syncopal episode but regained consciousness shortly afterward. The patient denied oral intake due to nausea and vomiting. He is a hotel chef who recently immigrated from Argentina and living at temporary shelters with his family. His vitals show a blood pressure of 80/52 mmHg, respiratory rate of 17/min, oxygen saturation of 98% on room air. On physical examination, the patient was clinically dehydrated and was noted to have a mild degree of skin pigmentation. A CT chest and abdomen reveal multiple cavitations in the upper lobe and evidence of bilateral adrenal cortex fibrosis from chronic infection. Laboratory investigations reveal sodium 133 mEq/L, potassium 3.1 mEq/L, glucose 91 mEq/L. Serum cortisol levels are low, and ACTH is high. The patient was admitted for observation and treatment. What is the most likely infectious etiology underlying this patient's condition?

## Choices:

1. Mycobacterium tuberculosis
2. Pneumocystis jirovecii
3. Mycobacterium avium
4. Ebstein-Barr virus

## Answer: 1 - Mycobacterium tuberculosis

## Explanations:

- In the developing world, tuberculosis is the most common etiology of infection-induced adrenal insufficiency. It leads to adrenal insufficiency by infecting the gland, leading to chronic infection and fibrosis and eventual adrenal cortex destruction.
- A CT scan of the abdomen may show calcification of the adrenals, as seen with adrenal tuberculosis.
- Consider adrenal tuberculosis in patients who recently immigrated to the USA from an endemic area, who are immunocompromised, recently released from jail, or homeless. After stabilization, the patient will need to be tested for tuberculosis with a tuberculin skin test.
- All the other answer choices are other infective etiologies that may lead to an adrenal crisis; however, they are primarily AIDs-defining illnesses. This patient has no obvious risk for HIV/AIDs and does not practice high-risk sexual activities. The patient does not have any history of blood transfusions or IV drug use.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Addisonian Crisis

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## Question 345: A patient with a BMI of more than 99%, short stature, and easy fatiguability of one year, develops dysphagia and feeling of something in his mouth. His annual screening 6 months ago showed borderline high thyroid stimulating hormone. What is the best next step?

## Choices:

1. Consult the oncology to exclude lymphoma
2. Consult the gastroenterology service to exclude gastroesophageal reflux disease
3. Consult the otolaryngology to exclude adenoid hypertrophy
4. Obtain a confirmatory thyroid stimulating hormone and T4 to exclude hypothyroidism

## Answer: 4 - Obtain a confirmatory thyroid stimulating hormone and T4 to exclude hypothyroidism

## Explanations:

- This patient has red flags which raise the suspicion of underlying endocrinology issue. These are obesity and short stature.
- The collection of signs and symptoms are part of manifestations of hypothyroidism in addition to frequent dysphagia make the possibility of ectopic lingual thyroid is very likely.
- The most common location for ectopic thyroid is the base of the tongue near the foramen cecum, which results in a lingual thyroid.
- Lymphoma and gastroesophageal reflux disease of more than one year will present with weight loss rather than weight gain. Adenoid hypertrophy would not cause all of these symptoms.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Ectopic Thyroid

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 346: A 43-year-old male presented to the clinic after he was found to have hypercalcemia on routine labs. He was previously healthy, and he takes no medications. His father and grandfather have had medullary thyroid carcinoma. The patient is afebrile, blood pressure 140/80 mmHg, heart rate of 75 beats\min regular, and saturation of 98% on ambient air. The examination shows clear lungs auscultation and normal S1 and S2 with no heart murmurs. Additional labs show a calcium level of 12.4 mg\dL, fasting glucose of 97 mg\dL, the parathyroid hormone 111 pg\mL, 25-hydroxy vitamin D 30 ng\mL, creatinine 0.7 mg\dL. What should be checked in this patient before starting the most suitable treatment regarding his case?

## Choices:

1. Urine and blood metanephrines
2. Renin activity and aldosterone level
3. TSH and thyroid hormones level
4. Admit the patient and start him on phenoxybenzamine

## Answer: 1 - Urine and blood metanephrines

## Explanations:

- This patient has hypercalcemia with elevated PTH level and normal V25-hydroxy Vitamin D level. This is most likely due to primary hyperthyroidism. Knowing that he has a family history of thyroid medullary carcinoma, this indicates a further workup to see if the patient has multiple endocrine neoplasia syndromes and especially MEN2.
- The current guidelines state that surgery should be recommended for asymptomatic primary hyperparathyroidism when: Serum calcium is more than 1 mg/dL greater than the upper limit of normal, Age younger than 50 years, Osteoporosis 4- GFR less than 60 mL/min, Urine calcium greater than 400 mg/24 hours, and evidence of renal calcification or stones.
- This case requires surgical intervention because of the patient according to the guidelines. But before the surgery, pheochromocytoma should be ruled out as per the family history, the patient might have multiple endocrine neoplasia type 2A, and this mandates ruling out pheochromocytoma.
- Multiple endocrine neoplasia type 2A: hyperparathyroidism, pheochromocytoma, and medullary thyroid carcinoma.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Primary Hyperparathyroidism

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 347:

A 46-year-old man presents to the clinic for a follow-up visit. Their screening standard lipid profile is relatively unremarkable but further testing reveals lipoprotein(a) levels of 63 mg/dL (reference range 30 mg/dL). The patient request natural supplements to lower his Lp(a) levels. Which of the following supplements is most likely to be effective for this patient's condition?

## Choices:

1. Omega 3 fatty acids
2. Red yeast rice
3. Garlic
4. L-carnitine

## Answer: 4 - L-carnitine

## Explanations:

- There are no supplements approved to treat elevated Lp(a) levels. Some supplements do exist which do favorably alter and improve lipid profiles but none are FDA approved or recommended for direct first-line treatment of lipid disorders.
- There is evidence that L-carnitine can lower Lp(a) levels. The therapeutic effect and clinical significance are unknown.
- While certain supplements may have a potential marginal benefit on Lp(a), none have been thoroughly studied or approved for this purpose.
- Red yeast rice essentially contains a statin and would not have any real effects on Lp(a) levels. Omega 3 fatty acids can lower triglyceride levels and may have a marginally beneficial effect on HDL.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Lipoprotein A

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 348: A 27-year-old woman presents to the clinic with fever and sore throat. She was recently diagnosed with Graves disease around two months ago and is being treated with methimazole. She denies any cough, runny nose, sick contacts. Which of the following is the next best step in the management of this patient?

## Choices:

1. Give penicillin V and continue methimazole
2. Obtain blood cultures and continue methimazole
3. Obtain complete blood count with differential and stop methimazole
4. Give penicillin V and stop methimazole

## Answer: 3 - Obtain complete blood count with differential and stop methimazole

## Explanations:

- Patients on methimazole are at increased risk of agranulocytosis, which is a rare but serious complication, and most cases are seen within the first 3-6 months of starting the medication.
- This patient's clinical presentation is suspicious for that, and hence methimazole should be stopped immediately, and CBC with differential should be obtained.
- An absolute neutrophil count below 500/microL confirms the diagnosis. It is managed by stopping the offending agent. Infectious workup should be done, broad-spectrum antibiotics and granulocyte colony-stimulating factor should be used for the treatment of infection and to improve the neutrophil count.
- Every patient methimazole should be educated about this side effect and advised to stop the medication and seek medical care immediately in case of fevers, sore throat, oral ulcerations.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Thyroiditis

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 349:

A 29-year-old man presents to the fertility clinic with his wife for infertility. There is no significant past medical or sexual history. On examination, he is vitally stable, with no significant exam findings and bilaterally normal testicle size. On investigation, the semen analysis reveals 5 percent sperm that were mobile. Seminal fluid volume is 2.5 cc, with a normal pH (7.2) and positive fructose. Repeat semen analysis yielded similar results. The patient has a high titer of anti-sperm antibodies. What would be the next best step in management?

## Choices:

1. Cyclosporine
2. Cyclical steroids
3. Plasmapheresis
4. Testosterone

## Answer: 2 - Cyclical steroids

## Explanations:

- Some males have a high titer of anti-sperm antibodies. This is most noticeable on semen analysis with a high percentage of dead or immobile sperm.
- Anti-sperm antibodies often develop when the blood-testis barrier has been breached.
- Anti-sperm antibodies are often found in patients who have suffered testicular trauma, testicular torsion, vasectomy, orchitis, or cryptorchidism.
- Treatment of infertile couples with anti-sperm antibodies is with cyclical steroids but assisted reproduction may sometimes be necessary for conception. The downside to the use of steroids is the side effects. Also, treatment success and conception are not always definite. Having anti-sperm antibodies is only one aspect of infertility, and the use of steroids therapy may not reverse or end infertility.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Male Infertility

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 350:

A 32-year-old African American male presents to the office for a follow-up on hypertension and lab work. He has been taking amlodipine 10 mg and hydrochlorothiazide 50 mg daily. He brings his blood pressure measurements to the office for the past two weeks, and all systolic blood pressure measurements are in the 170s and diastolic measurements in the 90s. He also states that he has started to develop muscle cramps and palpitations and that his mother had early-onset hypertension and stroke in her 40's. His recent lab work also shows potassium of 2.7 mEq/l. What is the next best test to lead towards a correct diagnosis?

## Choices:

1. Plasma renin activity and plasma aldosterone
2. Computed tomography (CT) angiogram of the abdomen and pelvis
3. Adrenal venous sampling
4. Urine metanephrine test

## Answer: 1 - Plasma renin activity and plasma aldosterone

## Explanations:

- Plasma renin activity and plasma aldosterone are the preferred initial test if there is clinical suspicion for primary hyperaldosteronism. The patient has hypokalemia, resistant hypertension, and two max dose medications, and significant family history. Plasma aldosterone to plasma renin activity ratio greater than 20 is suggestive of primary hyperaldosteronism.
- CT angiogram of the abdomen and pelvis will show other causes of resistant hypertension like bilateral renal artery stenosis. This test can provide information for the diagnosis of primary hyperaldosteronism, allowing the provider to see any possible tumors in the adrenal gland; however, it is not the best initial test.
- Adrenal venous sampling is more specific to diagnose which adrenal gland is secreting more aldosterone and is further in the workup for those who can undergo adrenalectomy. Plasma renin activity and plasma aldosterone is still the best initial choice.
- Plasma renin activity and plasma aldosterone is the best initial test for suspicion of primary hyperaldosteronism, and urine metanephrine test is specific for pheochromocytoma. Although the patient does have high blood pressure and palpitations, he is not experiencing any other symptoms including anxiety, hot flashes, headache, shortness of breath, or tremors. Pheochromocytoma also typically causes episodic hypertension and symptoms.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Primary Hyperaldosteronism

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## Question 351: A 67-year-old man is being evaluated for long-standing thyrotoxicosis. Thyroid function labs demonstrate a suppressed TSH. Ultrasound demonstrates an enlarged thyroid without a nodule. He is presumed to have Graves disease. However, the I-123 radioactive iodine uptake test (RAIU) study does not demonstrate increased radiotracer uptake at 24 hours. Which of the following is the next best test to confirm the diagnosis in this patient?

## Choices:

1. I-131 scan
2. I-123 scan with tracer uptake measured at 6-hour delay
3. Pertechnetate scan with 24-hour delay
4. Tc99m MIBI scan

## Answer: 2 - I-123 scan with tracer uptake measured at 6-hour delay

## Explanations:

- Graves disease classically presents as hyperthyroidism with a suppressed TSH.
- Occasionally in Graves disease, the turnover of thyroid hormone is so rapid that the I-123 that was concentrated and orgnanified into T4 and T3 in the thyroid gland is already secreted into the bloodstream by the thyroid gland when scanned at 24 hours.
- By measuring the RAIU earlier, the scan is able to capture the increased RAIU seen in Graves disease before it is secreted.
- I-131 is often used to treat Graves disease. However, it is not used for the initial RAIU evaluation.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### I-123 Uptake

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## Question 352:

A 16-year-old girl was diagnosed with type 1 diabetes mellitus at age 9 when she was found to have a fasting glucose of 132 mg/dL on routine labs and hemoglobin A1c (HbA1c) 6.8% and started on an insulin pump. Her HbA1c measurements have always been between 5.9% and 6.4%. Her mother, who has always been of normal BMI, was diagnosed with gestational diabetes and started on insulin when her glucose did not improve following delivery. Her maternal grandfather was excused from military service after urinalysis during a draft physical showed glucosuria; he was diagnosed with diabetes at age 18. He has been managed with insulin for more than 45 years and has no complications related to diabetes. It is suspected that the patient may have been misdiagnosed with type 1 diabetes mellitus. What is the next best step in evaluating this patient?

## Choices:

1. Repeat HbA1c
2. Genetic testing
3. C-peptide testing
4. Auto-antibody testing

## Answer: 4 - Auto-antibody testing

## Explanations:

- Auto-antibody testing with ICA, IAA, IA-2A, and GAD should be performed first to rule out type 1 diabetes mellitus before considering genetic testing for HNF1A/4A/1B mutations.
- Studies of large groups of patients with presumed type 1 and type 2 diabetes reveal MODY in perhaps up to 1 to 3% of all patients.
- Some forms of MODY may not require treatment at all (MODY 2) or may be managed with sulfonylureas. There have been many reports of patients treated for decades with insulin who were able to change to oral therapy or stop treatment altogether.
- Genetic testing for MODY is available and should be considered for patients with clinical presentation not typical for either type 1 or type 2 diabetes and a pattern of seemingly autosomal dominant diabetes. However, access is limited and should only be considered after other tests have been negative.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Maturity Onset Diabetes in the Young

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## Question 353: A 56-year-old patient with type 2 diabetes mellitus has been complaining of vague pains in her body for the past 2 years. Sometimes she gets pins and needle sensations and at other times she has pain sensation. She has also developed weakness in her arms and legs and often develops abdominal pain. A diagnosis of neuropathy is made but what is the most common type of diabetic neuropathy in this population?

## Choices:

1. Sensory
2. Distal symmetric polyneuropathy
3. Autonomic
4. Focal

## Answer: 2 - Distal symmetric polyneuropathy

## Explanations:

- Most patients with diabetes mellitus will develop neuropathy at some point in their life.
- The most common type is distal symmetrical polyneuropathy, which has many presentations.
- Distal symmetrical polyneuropathy may affect sensation, motor, and autonomic nerves.
- Painful paresthesias and numbness starting in the toes are often the most common presentation.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Peripheral Diabetic Neuropathy

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## Question 354: A 28-year-old female has questions about choosing an intrauterine device (IUD). She has one child who is 18 months old. She desires a future pregnancy, but she is not ready yet. She asks the clinician about the advantage of a progesterone-containing IUD (PIUD) over a copper-containing IUD (CIUD)?

## Choices:

1. PIUD may be left in place longer for more years of contraception than the CIUD
2. CIUD will increase the risk of ectopic pregnancy greater than the PIUD
3. Both types of IUDs decrease the risk of ectopic pregnancy
4. The PIUD improves menorrhagia compared to the CIUD

## Answer: 4 - The PIUD improves menorrhagia compared to the CIUD

## Explanations:

- In addition, the progesterone will cause anovulation, thicken cervical mucus, and alter the endometrium, which decreases menstrual bleeding.
- For this reason, it is beneficial in women who have heavy periods or who would like an IUD but do not wish to have dysmenorrhea.
- The levonorgestrel IUD only lasts 3-5 years, and once removed, fertility is quickly restored. The copper IUD lasts 10 years.
- Rarely perforation of the uterus can occur, but this also depends on the skill of the healthcare provider. Surgery is often required when perforation of the uterus occurs.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Intrauterine Device

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## Question 355:

A 38-year-old single mother of 2 daughters presents to the clinic with a report from a CT scan of her abdomen revealing a 3.2 cm mass in her right adrenal gland. The scans were performed two weeks ago as part of her preoperative evaluation for a proposed elective hysterectomy to manage her large, symptomatic submucosal uterine leiomyoma. She denies having any nausea, headache, or palpitation. Currently, she is afebrile with a blood pressure of 129/86 mmHg and a pulse of 101 beats per minute. Physical examination is unremarkable. What is the next best step in the management of this patient?

## Choices:

1. Repeat abdominal CT scan in 6 months
2. Pituitary MRI
3. Plasma fractionated metanephrine levels
4. Selective venous sampling of catecholamines

## Answer: 3 - Plasma fractionated metanephrine levels

## Explanations:

- Although its common to discover an adrenal incidentaloma on an abdominal CT scan, all such adrenal masses must be evaluated for hormone hypersecretion and malignancy before deciding on definitive management.
- As a rule in endocrinology, laboratory testing precedes imaging. In any patient with an adrenal mass, essential lab test for assessment of hormone hypersecretion including: 24-hour urine free cortisol levels, plasma fractionated metanephrine levels, vanillylmandelic acid, and 17-keto steroids assay, may be performed.
- If plasma fractionated metanephrine levels come out high in this patient, then further imaging with a PET or octreotide scan can be performed to assess for any extra-adrenal locations of a suspected pheochromocytoma. Functional studies and assessment for a suspected adrenal malignancy must be done when an incidentaloma is identified on imaging before deciding on simple observation and followup.
- Selective venous sampling for catecholamines is no longer recommended due to the high variability of the results and the risk of accidentally inciting a hypertensive crisis.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Chromaffin Cell Cancer

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 356: A 45-year-old man presents to the hospital with 4 weeks of dry mouth and difficulty eating following treatment for American Thyroid Association (ATA) high-risk thyroid carcinoma. Which of the following is most likely responsible for his symptoms?

## Choices:

1. Recurrent laryngeal nerve damage following thyroidectomy
2. Radioiodine adjuvant therapy
3. Radioiodine whole body scanning
4. Metastasis to the salivary glands

## Answer: 2 - Radioiodine adjuvant therapy

## Explanations:

- Xerostomia is one of the most common side effects associated with radioiodine therapy.
- Whole-body scans require a small dose (2-5 mCi) compared to therapeutic dosing (30-150 mCi) therefore the patient's symptoms are likely to due to adjuvant therapy.
- Common complications associated with chronic hyposalivation include increased incidence of dental caries, dysgeusia (altered taste), and difficulty with mastication and deglutition.
- Damage to the recurrent laryngeal nerve is a risk factor associated with thyroidectomy. However, that would cause hoarseness, not xerostomia. Thyroid cancer really metastasizes. When it does, it typically spreads to the lymph nodes, lungs, and bone.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### 131 I Sodium Iodide

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 357:

A 48-year-old woman has been admitted to the hospital after she presented to the emergency department with complaints of abdominal and flank pain, constipation, polyuria, muscle aches, and mood disturbances. On arrival, her serum calcium level is 13.8 mg/dL and serum phosphate level is 2.1 mg/dL. Her urinary analysis reveals raised alkaline phosphatase and urinary cAMP levels. Which of the following best explains her low serum phosphate levels?

## Choices:

1. Increasing the resorption of bone and increasing the renal phosphate reabsorptive maximum rate of transport (Tm) due to raised PTH levels
2. Increasing the resorption of bone and decreasing the renal phosphate reabsorptive Tm due to raised PTH levels
3. Decreasing the resorption of bone and increasing the renal phosphate reabsorptive Tm due to low PTH levels
4. Decreasing the resorption of bone and decreasing the renal phosphate reabsorptive Tm due to low PTH levels

## Answer: 2 - Increasing the resorption of bone and decreasing the renal phosphate reabsorptive Tm due to raised PTH levels

## Explanations:

- This patient has most likely presented with symptoms of primary hyperparathyroidism as evident by high serum calcium, low serum phosphate levels and increased urinary excretion of alkaline phosphatase and cAMP due to increased bone turnover.
- Parathyroid hormone causes the resorption of bone and the decreased reabsorption of renal phosphate. PTH binds to sites in the proximal tubule that block phosphate reabsorption. PTH increases the uptake of phosphate from the bones and intestine into the systemic circulation.
- In cases of primary hyperparathyroidism, the normal physiologic role of the parathyroid hormone(PTH) is exaggerated due to excessive production of the PTH. The most common cause of primary hyperparathyroidism is parathyroid adenoma or hyperplasia.
- In the intestines, PTH mediates the absorption of both phosphate and calcium. PTH has no direct effects on the small intestine, the downstream effects of PTH on vitamin D synthesis by increasing its activated form. Vitamin D increases calcium and phosphate absorption from the gut.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Physiology, Parathyroid

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## Question 358: A 70-year-old male with a past medical history of diabetes mellitus presents to the clinic for erectile dysfunction with onset one year ago. The wife present in the room states the patient has difficulty maintaining erection and is impacting the relationship. The patient is extremely frustrated. Physical exam with chaperone shows no varicocele, testicular swelling, rashes, or genital lesions. The patient denies nocturnal penile tumescence. What labs should be ordered at this time?

## Choices:

1. Follicle-stimulating hormone and luteinizing hormone
2. Morning testosterone level only
3. Prostate-specific antigen
4. Vitamin D, B12, and folate

## Answer: 2 - Morning testosterone level only

## Explanations:

- Morning testosterone level needs to be ordered since testosterone levels are highest in the mornings.
- After the diagnosis of testosterone deficiency has been made with two repeat measurements, follicle-stimulating hormone and luteinizing hormone need to be then ordered to rule out secondary hypogonadism. Follicle-stimulating hormone and luteinizing hormone regulate spermatogenesis by Sertoli cells and testosterone production by Leydig cells in the testis. It should be checked to rule out secondary hypogonadism.
- Referral to urology is recommended if there is an increase in the prostate-specific antigen (PSA) level of greater than 1.4 nanograms/mL within any 12-month period.
- A complete blood count is used to establish baseline hemoglobin and hematocrit. Testosterone supplementation can result in polycythemia, so it should be checked regularly in patients getting testosterone supplementation. Liver function tests should be done as advanced liver disease often presents with hypogonadism, such as ED, infertility, decreased libido, and testicular atrophy

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Androgen Replacement

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## Question 359:

A 17-year-old male presents with a history of fatigue and recurrent kidney stones for 1 year. He takes omeprazole for persistent heartburn. His father died of pancreatic cancer at the age of 35 years. His clinical examination reveals a 2 cm nodule on the left anterolateral aspect of the neck. His blood investigations reveal a serum calcium of 11.7 mg/dL (8.5-10.2 mg/dl). His neck ultrasound scan is inconclusive. What is the most appropriate next imaging study to diagnose this patient's condition?

## Choices:

1. 99-technitium sestamibi scan
2. CT angiogram of the neck
3. MRI of the neck
4. Ultrasound with Doppler

## Answer: 1 - 99-technitium sestamibi scan

## Explanations:

- This patient likely has multiple endocrine neoplasia (MEN) type I syndrome, given the family history of pancreatic carcinoma and the patient's symptoms and elevated calcium indicative of parathyroid etiology. Ultrasound is used initially to identify the different parathyroid glands.
- Ultrasound is a good initial option due to its relatively low cost in comparison to other imaging modalities and high sensitivity. If ultrasound imaging does not identify four glands at minimum (the average number of parathyroid glands), then additional imaging is required.
- The 99-technitium sestamibi scan is a specific type of CT scan, which should be the next imaging to be considered. It aids in the characterization of individual parathyroid glands and can present information on the activity and size of each parathyroid gland.
- As such, sestamibi scans are important in diagnosing ectopic parathyroid glands as well as denoting hyperactivity of existing parathyroid glands contributing to this patient's diagnosis of parathyroid pathology related to MEN type I.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Multiple Endocrine Neoplasia Type 1

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## Question 360:

A 50-year-old woman with a 6-month history of polymyositis complains of increasing weakness. After diagnosis, she was started on 60 mg of prednisone a day, which has been tapered to 30 mg/day. The initial creatinine kinase was 3,000 mg/dl, but three weeks ago, it was only slightly elevated to 400 mg/dl (normal, greater than or equal to 275 mg/dl). Examination demonstrates cushingoid facies, 4/5 proximal muscle strength, and no abnormal heart or lung findings. The current creatinine kinase is 375 mg/dl. Of the following, which is the best step to take next in the treatment of this patient?

## Choices:

1. Increase prednisone to 60 mg/day and reevaluate in 2 weeks
2. Refer to surgery for biopsy of one of the quadriceps muscles
3. Decrease prednisone to 20 mg/day and reevaluate in 2 weeks
4. Add methotrexate, 7.5 mg/wk

## Answer: 3 - Decrease prednisone to 20 mg/day and reevaluate in 2 weeks

## Explanations:

- This patient in the current scenario with polymyositis has evidence of steroid myopathy.
- There is increasing proximal weakness without any increase in the creatinine kinase. The best way to determine whether steroid myopathy is contributing to the weakness is to try a steroid taper and see if it improves.
- A second-line agent such as methotrexate will be useful, although methotrexate may take several weeks to months to be effective.
- Biopsy of the muscle might reveal type 2 fiber atrophy, which is unique of steroid-induced myopathy, but in the setting of polymyositis, the diagnosis might be difficult to interpret.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Polymyositis

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## Question 361:

A 72-year-old African-American woman presents complaining of dry cough and shortness of breath for 2 weeks. She feels short of breath when lying down, and she also reports weight loss and palpitation. Her past medical history is significant for peptic ulcer disease, hypertension, bilateral knee arthritis, and osteopenia. Her medications include omeprazole, famotidine, calcium supplementation, and acetaminophen. Physical examination reveals no acute distress. The thyroid gland is bilaterally enlarged with a palpable right lobe nodule, measuring around 3 cm. The lower border of the right lobe is not palpable due to the overlying clavicle. Chest auscultation reveals a high-pitched sound during inspiration. Thyroid function tests show free T4 1.9 ng/dl (reference 0.8-1.8 ng/dl), free T3 5.2 pg/dl (reference 2.8-4.4 pg/dl) and TSH less than 0.01 IU/L (reference 0.27-4.20 IU/L). The pulmonary function test is consistent with upper airway obstruction. CT scan of the chest reveals an 8.5 cm thyroid nodule extending from neck to tracheal bifurcation. What is the most appropriate next step in managing this patient?

## Choices:

1. Radioactive iodine treatment
2. Neck ultrasound
3. Start methimazole and beta-blockers
4. Start methimazole and beta-blocker in preparation for thyroidectomy

## Answer: 4 - Start methimazole and beta-blocker in preparation for thyroidectomy

## Explanations:

- Total thyroidectomy is the recommended treatment for symptomatic substernal goiter. But the patient has hyperthyroidism and needs to be prepared for surgery to become euthyroid to prevent a thyroid storm during surgical intervention.
- The thyroid gland extends to tracheal bifurcation, and sternotomy and thoracotomy are required.
- Only up to 17 percent of patients with substernal goiter require an extra cervical approach like sternotomy or thoracotomy. Extension to the aortic arch is an indication to involve a thoracic surgeon in the procedure.
- Radioactive iodine has no role in the treatment of substernal goiter. It may cause radiation-induced thyroiditis and possible acute enlargement of the thyroid gland in the closed chest cavity, causing more respiratory distress.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Substernal Goiter

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## Question 362:

A 40-year-old man is seen during a routine medical check-up. He is asymptomatic and has no significant past medical history. Physical examination is unremarkable. Further evaluation of labs shows a low-density lipoprotein (LDL) of 250 mg/dL, creatinine of 0.7 mg/dL, total bilirubin of 2.7 mg/dL, haptoglobin of less than 6 mg/dL, and glycosylated hemoglobin of 6.9%. He is suspected of having a genetic disorder of lipid metabolism. Which of the following tests would most likely differentiate it from a disorder that causes accumulation of plant sterols and hemolysis?

## Choices:

1. Subcutaneous fat biopsy and Congo staining
2. Gas chromatography
3. CT scan of the liver
4. DNA sequencing

## Answer: 2 - Gas chromatography

## Explanations:

- Familial hypercholesterolemia (FH) is characterized by premature coronary artery disease, tendon xanthomas, elevated LDL, and normal triglycerides.
- It is autosomal codominant and is the most common of these syndromes due to a single gene.
- FH is mostly a clinical diagnosis, similar to sitosterolemia, that causes accumulation of plant sterols and episodes of hemolysis. These two disorders are distinguished by gas chromatography.
- Familial hypercholesterolemia is challenging to treat and requires intensive multi-lipid lowering agents. Sitosterolemia can be easily treated with lifestyle modifications, ezetimibe, or bile acid sequestrants. DNA sequencing and subcutaneous fat biopsy have no role in differentiating the two disorders.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Familial Hypercholesterolemia

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## Question 363:

A 58-year-old African American female with a history of severe asthma presents with a headache that started 2 days ago. She has no significant past medical history and is on no medications. Vital signs show a blood pressure of 240/130, pulse 105 bpm, and respirations 18/minute. Extraocular muscles are intact. The pupils are equal round and reactive to light. There is bilateral papilledema. the cardiovascular exam shows a regular rate and rhythm without murmurs or extra heart sounds. Lungs have scattered expiratory wheezes. Which of the following should be the initial treatment?

## Choices:

1. IV nitroprusside
2. IV esmolol
3. IV furosemide
4. Sublingual nitrates

## Answer: 1 - IV nitroprusside

## Explanations:

- This is a case of a hypertensive emergency given the elevated blood pressure and evidence of end-organ damage.
- It requires immediate admission to the ICU and treatment with IV nitroprusside.
- Beta-blockers should be avoided in patients with severe asthma who are wheezing.
- The goal for lowering the blood pressure should be to decrease the mean arterial pressure by 25% in the first 24 hours.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Malignant Hypertension

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 364:

A 40-year-old woman presents to the clinic for a follow-up visit. She has been taking liraglutide for six months and has maintained exercise of 180 minutes per week. The patient feels well and is willing to continue her current treatment regimen. Vital signs of the patient are within normal limits. The patient has lost 24 lbs (11 kg) over the last year, an 9% of total body weight loss. This is her lowest weight since she was a child. What is the most likely expected outcome if she maintains her current treatment regimen?

## Choices:

1. Eventually, she will plateau and start to regain weight.
2. She will relapse to her previous weight.
3. She will continue to lose weight but at a slower pace.
4. She will lose weight until she plateaus at her ideal body weight.

## Answer: 1 - Eventually, she will plateau and start to regain weight.

## Explanations:

- Patients on a weight loss regimen often regain the weight as they reach the plateau and become disheartened and secondary to a decreased caloric utilization at a reduced weight.
- A 90 kg patient burns fewer calories than a patient weighing 130 kg while performing the same task, representing a decreased caloric utilization in patients with less weight compared to a patient with higher body weight.
- To avoid an eventual weight regain, the treatment regimen should be continually adjusted.
- This should be discussed early in the treatment plan to prevent frustration, with preemptive plans to adapt and intensify the treatment regimen accordingly.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Physical Activity And Weight Loss Maintenance

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 365: A 17-year-old girl has a painless 2 by 2 cm palpable mass in the region of the left lobe of the thyroid gland. No adenopathy is palpable. The fine needle aspiration (FNA) result confirms the most likely diagnosis. What is the next preferred management?

## Choices:

1. Total thyroidectomy
2. Suppression therapy
3. Left thyroid lobectomy
4. Repeat FNA in 6 months

## Answer: 3 - Left thyroid lobectomy

## Explanations:

- The most common etiology of a pediatric solitary thyroid nodule is follicular adenoma.
- They are well circumscribed, solitary, and encapsulated.
- Follicular adenomas contain glandular epithelium. Commonly, hemorrhage, fibrosis, calcification, and cystic changes are seen.
- Regarding the several possible management of follicular lesions and adenomas, repeating the FNA has been mentioned. Though deferring for a prolonged time of six months would be a concern. Total thyroidectomy is a part of the treatment of choice for thyroid malignancies, including papillary, follicular, and medullary thyroid carcinoma.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Thyroid Adenoma

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 366:

A 6-year-old girl is brought to the clinic by her mother with concerns of excess body hair. According to the mother, her daughter started to develop hair in the axillary and pubic area 4 months ago, which has progressively increased in quantity and become thicker. She denies a history of menstrual bleeding. She has no past medical problems and does not take any medications or supplements. Family history is remarkable for a younger sister who required genital reconstructive surgery at birth. The physical exam shows an alert, well-looking, friendly girl. Her temperature is 36.8 C, pulse 90/min, blood pressure 100/60 mmHg, and respiratory rate 16/min. Comedogenic acne is seen on the forehead and nose. Growth parameters reveal weight on the 60th and height on the 90th percentile. The height velocity is 7 cm/year. Sexual maturity staging is stage I for breast and stage IV for pubic hair. The systemic exam is unremarkable. Which of the following findings is most consistent with the patient's condition?

## Choices:

1. Elevated serum estradiol
2. Suppressed serum TSH
3. Elevated serum 17 hydroxyprogesterone
4. Bony deformities on skeletal survey

## Answer: 3 - Elevated serum 17 hydroxyprogesterone

## Explanations:

- This girl has signs of secondary sexual development before the age of 8 years along with accelerated height velocity. This clinical picture is suggestive of precocious puberty.
- The presence of excess adult-type pubic hair, axillary hair, and acne in this patient suggests the cause of puberty is an excess production of androgens. Other signs and symptoms of adrenal excess in girls include accelerated linear growth and hirsutism.
- Non-classical congenital adrenal hyperplasia is an important cause of precocious pseudopuberty in both boys and girls and occurs due to increased androgen production.
- Non-classical congenital adrenal hyperplasia is caused by a deficiency in 21-hydroxylase enzyme (CYP21A2) which is responsible for converting 17-hydroxyprogesterone to 11-deoxycortisol. Unlike classical congenital adrenal hyperplasia, enzyme deficiency in non-classical forms is mild and only leads to excess androgen production. The production of glucocorticoid and mineralocorticoid is maintained so salt-wasting does not occur in non-classical forms.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Precocious Pseudopuberty

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 367:

A 16-year-old female presents to the office for the evaluation of acne. On examination, she is noted to have an atypical body habitus with thin-appearing arms and legs and central adiposity. On further questioning, the patient states that she has had other first degree relatives with similar changes and that she only experienced these changes around the time of puberty. Which complication requiring hospitalization has been seen in patients with this condition?

## Choices:

1. Fat loss in face, neck, and abdomen
2. Hypertriglyceridemia induced pancreatitis
3. Cerebrovascular accident
4. Hepatic steatosis

## Answer: 2 - Hypertriglyceridemia induced pancreatitis

## Explanations:

- Atypical body habitus should prompt a more in-depth history. Thin arms and central adiposity are clinical findings suspicious for a lipodystrophy syndrome.
- The metabolic derangements in patients with familial partial lipodystrophy may lead to hypertriglyceridemia severe enough to induce pancreatitis. Workup should include a complete metabolic panel and lipid panel. Hepatic steatosis, while a known complication is unlikely to lead to hospitalizations.
- A family history of similar body habitus should lead the clinician to consider a familial condition.
- Changes around puberty indicate that this patient did not have such findings at birth. This makes the likelihood of congenital generalized lipodystrophy much less likely. In acquired partial lipodystrophy, patients appear normal at birth and throughout childhood regarding fat distribution but develop clinically apparent changes near puberty. In contrast to the fat loss involving the extremities, patients demonstrate a fat gain in the face, neck, and abdomen.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Lipodystrophies

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 368: A mother of a 4-day-old newborn presents to your clinic as a follow-up appointment due to an elevated Succinylacetone level found on routine examination. The mother says that her father died in his 50's due to complications from a condition in which his "protein levels were elevated". Without early intervention and treatment, what is the most likely cause of death in this patient?

## Choices:

1. Cardiac arrest
2. Hepatocellular carcinoma
3. Bladder cancer
4. Pancreatic cancer

## Answer: 2 - Hepatocellular carcinoma

## Explanations:

- An elevated succinylacetone level is highly specific and sensitive for the condition hypertyrosinemia.
- Hypertyrosinemia is due to enzyme deficiencies in the tyrosine degradation pathway
- Early diagnosis and treatment can reduce the chance of developing hepatocellular carcinoma.
- Other complications of this condition include intellectual disability, kidney disease, and multi-organ failure.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hypertyrosinemia

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## Question 369:

A 16-year-old boy with a history of hypertension for a few months is brought to the hospital for palpitations, tremors, flushing, and diarrhea. He is found to have an elevated calcium level. On examination, there are palpable anterior cervical lymph nodes. Ultrasound abdomen reveals abdominal lymphadenopathy. Which of the following is the most likely diagnosis?

## Choices:

1. Essential hypertension
2. Multiple endocrine neoplasia type 2
3. Familial hypocalciuric hypercalcemia
4. Williams syndrome

## Answer: 2 - Multiple endocrine neoplasia type 2

## Explanations:

- MEN 2 is a subtype of multiple endocrine neoplasias (MEN). It has subtypes of its own. MEN 2 is commonly an autosomal dominant inherited disorder associated with several tumors of the endocrine system.
- MEN 2 involves medullary thyroid carcinoma, pheochromocytoma, and parathyroid adenoma. Von Hippel-Lindau disease is also associated with MEN 2.
- Most of the time, patients present with symptoms caused by medullary thyroid cancer (MTC). MTC accounts for 5% of all thyroid tumors. It is often malignant and is the most common cause of death in patients with MEN 2.
- The overall survival of patients with MTC is 86% at 5 years and 65% at 10 years. Its metastases cause lymphadenopathy in the neck and the mediastinum. It spreads to the liver, lung, and bone.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Multiple Endocrine Neoplasias Type 2

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## Question 370:

A 35-year-old female at 25-week gestation comes to the clinic for a routine pelvic ultrasound due to a low-lying placenta. The ultrasound and physical exam are unremarkable. The provider decides to perform a 75 g of glucose tolerance test (OGTT). Based on the results, they rule out gestational diabetes for this patient. Which one of the following is the most likely finding during the OGTT for this patient?

## Choices:

1. 2-hour glucose of 155 mg/dL
2. Fasting glucose of 95 mg/dL
3. 1-hour glucose of 160
4. 1-hour glucose of 190 mg/dL

## Answer: 3 - 1-hour glucose of 160

## Explanations:

- According to the American Diabetic Association guidelines, fasting glucose of greater than 92 mg/dL on a 75 g OGTT indicates gestational diabetes mellitus.
- Per ADA guidelines, 1-hour glucose of greater than 180 mg/dL on a 75 g OGTT indicates gestational diabetes.
- A 2-hour glucose of greater than 153 mg/dL on a 75 g OGTT indicates gestational diabetes.
- Screening for gestational diabetes is recommended at 24 to 28 weeks of pregnancy.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Diabetes Mellitus Screening

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## Question 371: A 24-year-old man presents with remitting episodes of hand and foot weakness and sensory loss over his fingers and feet. The patient reports the presence of a yellowish-orange deposition in his tonsils since childhood. He mentions that his parents are related to each other, and he remembers a similar condition in his maternal uncle. On neurological examination, the patient is active, alert, and oriented to time, place, and person. Cranial nerve examination is unremarkable; motor strength is 2/5 in both upper and lower extremities. Sensation is intact and reflexes are equal bilaterally. Cerebellar and gait examinations show no abnormalities. What is the pathophysiology behind this patient's most likely condition?

## Choices:

1. Defect of metabolism that affect the function of the lysosome
2. Defect in glycogen storage
3. Defect in high-density lipoprotein cholesterol pick-up in peripheral tissue
4. Amyloid deposition within the tissues

## Answer: 3 - Defect in high-density lipoprotein cholesterol pick-up in peripheral tissue

## Explanations:

- The patient has Tangier disease, which occurs due to the accumulation of cholesterol eaters in many organs within the body, particularly the reticuloendothelial systems. These organs will appear yellow-orange in color and larger in size.
- The high-density lipoprotein (HDL) life cycle starts inside the cell when very small discoidal pre-beta-1, HDL picks up free cholesterol from cells with the help of ABCA transporter, defect in this stage will result in Tangier disease.
- Patients with this disease will have a cholesterol deposition manifestation in multiple tissues like in tonsils, which are considered the most characteristic feature. Cholesterol depositions will appear yellow or orange, hugely enlarged in children and young adults; usually, the first observed presentation.
- The diagnosis of Tangier disease requires a high index of suspicion. Besides clinical findings which could appear earlier in the first decades or wait till the second or third decades. Blood values remain the mainstay diagnostic tools to make a diagnosis. The patients regularly present with low HDL (less than 5 mg/dl ), a low Apo-a1 level below 5, besides low total plasma cholesterol (less than 150mg/dl).

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Tangier Disease

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## Question 372:

A 16-year-old visits his family clinician for a routine health check-up. He is in good health. He is not taking any medicines and has no history of significant medical illness. His vital parameters are within normal range, and his physical examination reveals no abnormalities. His white blood cells count is 10 x $10^9$/L, fasting blood sugar is 93.0 mg/dL, serum sodium is 139.0 mmol/L, and serum potassium is 4.0 mmol/L. However, a urinalysis report is positive for reducing substances, and the urine dipstick test for glucose is negative. Which of the following is the most appropriate advice for the patient?

## Choices:

1. Complete dietary restriction of fructose and sucrose
2. Complete dietary restriction of lactose and galactose
3. Decreases protein intake
4. Dietary restrictions and treatment are not necessary

## Answer: 4 - Dietary restrictions and treatment are not necessary

## Explanations:

- Essential fructosuria or benign fructosuria is an autosomal recessive disorder due to a deficiency of fructokinase that converts fructose into fructose 1-phosphate.
- Essential fructosuria has no clinical symptoms and consequences because hexokinase redirects additional fructose back into the glycolysis by converting fructose to fructose-6-phosphate. Therefore, there is no need for treatment and dietary restriction.
- Fructokinase does not utilize glucose as a substrate and is not affected by insulin or fasting.
- Essential fructosuria is diagnosed accidentally during urine examination. Urine chromatography for fructose serves as a confirmatory test to diagnose essential fructosuria.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Biochemistry, Fructose Metabolism

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## Question 373:

A 38-year-old woman presents to the clinic with a history of recurrent kidney stones. She is otherwise fit and well. Her father had Cushing disease and had pituitary surgery. His older sister was recently diagnosed with Hashimotos thyroiditis and acromegaly. An uncle of hers died from a neuroendocrine duodenal tumor. Her physical examination is unremarkable. An initial set of labs is shown below.

| | Patient value | Reference range |
|---|---|---|
| Parathyroid hormone | 85 pg/mL | 14-65 pg/mL |
| Adjusted calcium | 10.9 mg/dL | 8.5-10.2 mg/dL |
| 25-hydroxyvitamin D | 36 ng/mL | 25-80 ng/mL |
| Urinary calcium-creatinine | 0.028 | 0.14 |

Ultrasound neck does not reveal any abnormality. 99-Technitium sestamibi scan is inconclusive. Which of the following is the next best step in the management of this patient?

## Choices:

1. 4D- CT parathyroid
2. Ultrasound kidney
3. CT chest
4. Reassurance

## Answer: 1 - 4D- CT parathyroid

## Explanations:

- The patient has presented with hyperparathyroidism. Her family history is suggestive of either MEN1 or MEN4. Ultrasound is the first-line investigation. If this is inconclusive, then a 99-Technitium sestamibi scan is undertaken.
- 4D CT parathyroid is four-dimensional imaging undertaken to localize a parathyroid adenoma if ultrasound and 99-Technitium sestamibi scan are inconclusive.
- It enables accurate localization of parathyroid adenoma in the neck and ectopic locations.
- Ultrasound kidney will not add much to the diagnosis. The patient already has recurrent kidney stones. The patient has a confirmed diagnosis of hyperparathyroidism. Therefore further investigations will be needed to localize the parathyroid adenoma.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Multiple Endocrine Neoplasias Type 4

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## Question 374:

A 40-year-old female with a history of diabetes mellitus for the last twenty years, hypertension, smoking, and severe claustrophobia was seen in the emergency department with subjective chills and nonhealing right foot ulcer for six weeks. The examination reveals a wound with a clean base and some tenderness in the surrounding area. Despite the negative x-ray of her right foot, the provider suspects underlying osteomyelitis and orders a magnetic resonance imaging (MRI) study of her right foot. The patient declines the MRI due to her history of severe claustrophobia. What is the next best step in her management?

## Choices:

1. Wound exploration under general anesthesia
2. MRI of the foot under general anesthesia
3. Bone scan
4. Probe-to-bone test

## Answer: 4 - Probe-to-bone test

## Explanations:

- The probe-to-bone test is very useful in diagnosing osteomyelitis at the bedside.
- If the sterile metal probe hits the bone, then it is a positive test.
- Probe-to-bone tests can be performed at the bedside, and the results are known immediately.
- If the probe-to-bone test is inconclusive and the suspicion for osteomyelitis is still high then MRI or bone scan be performed.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Diabetic Foot Ulcer

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## Question 375: A 65-year-old man with a history of carcinoid tumor presents to the clinic with excessive sweating, heat intolerance, weight loss, fatigue, and weakness. He has been on interferon-alpha therapy for the past year. Which of the following therapies is most appropriate for this patient?

## Choices:

1. Reactive iodine
2. Acetaminophen
3. Methylphenidate
4. Abciximab

## Answer: 1 - Reactive iodine

## Explanations:

- This patient is experiencing symptoms of hyperthyroidism (excessive sweating, heat intolerance, weight loss, fatigue, and weakness). Hyperthyroidism is commonly treated with reactive Iodine.
- Interferon-alpha therapy is commonly associated with thyroid dysfunction (hyper and hypothyroidism).
- Therefore, it is critical to monitor the thyroid hormone levels of patients on Interferon-alpha therapy.
- Acetaminophen may be given to this patient for pain relief and symptomatic care. However, it would not directly treat this patient's hyperthyroidism. Methylphenidate is used to treat ADHD and abciximab is used as a blood thinner.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Interferon

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## Question 376: A family of three was admitted into the emergency department (ED), consisting of a mother and father in their early 40's with a nine-year-old son. All three started with nausea and nonbilious, non-bloody emesis within the last 5 hours. The child had nonreproducible abdominal pain in addition to the vomiting. The father had some tingling sensation in all his extremities, and the mother had no other initial complaints, but frequently complained the blood pressure cuff was too tight causing hand spasms when it would try to read her blood pressure. All three had eaten hamburgers on their last meal, cooked at home. All three were afebrile, normotensive and had no past medical history, no recent travel, and denied headaches or kerosene heaters in the home. What is the first medication the mother should receive?

## Choices:

1. Ondansetron
2. Calcium gluconate
3. Prochlorperazine
4. Vitamin B12

## Answer: 2 - Calcium gluconate

## Explanations:

- The mother is presenting the trousseau's sign, which is a carpopedal spasm with a prolonged inflated blood pressure cuff due to hypocalcemia.
- Fluoride toxicity can manifest hypocalcemia; physical signs include abdominal pain, muscle spasm, trousseau and chvostek's sign, paresthesias, confusion, and an electrocardiogram (EKG) of the patient can have a prolonged QTinterval.
- Most antiemetics can cause QT prolongation. Hypocalcemia, which is seen with fluoride toxicity, can cause a prolonged QTc, which is proportional to the degree of hypocalcemia. Providing an antiemetic before treating hypocalcemia would put the patient at risk for ventricular tachycardia or torsades.
- Remember to keep your differential broad, particularly with nausea and vomiting in a family. The sudden onset, the other small abnormal complaints about a typical foodborne pathogen should make you concerned for toxic exposure.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Fluorides and Fluorocarbons Toxicity

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 377:

A 17-year-old boy is brought to the psychiatric clinic with complaints of involuntary, irregular twitching of muscles of both arms and legs in addition to having abnormality in his gait, speech, and eye movements. The parents explain that he now remains confused, depressed, has started forgetting things, and there is a marked decline in intellectual activities. The child was well before these symptoms started happening. MRI, genetic testing, and EEG have been done. Which of the following biopsy findings are most likely to be present in this patient?

## Choices:

1. Tissue reaction pattern
2. Aggregates of abnormally-shaped glycogen molecules
3. Aggregates of IgA deposits
4. Clear vacuoles

## Answer: 2 - Aggregates of abnormally-shaped glycogen molecules

## Explanations:

- The presence of seizures in a teenage child along with neurodegenerative characteristics such as a decline in intellectual abilities, dementia, confusion, gate and speech abnormalities, and depression are suggestive of Lafora disease.
- Lafora is an autosomal recessive disorder that causes severe impairment in the development of the brain. The most prominent feature of Lafora disease is seizures. In addition, the other most common symptoms are mood disorder, ataxia, and dementia.
- Its diagnosis requires the presence of the pathognomic Lafora bodies (abnormal glycogen inclusions) in tissue biopsy in addition to the exclusion of other forms of PMEs. Pathognomonic periodic acid-Schiff (PAS) positive polyglucosan particles or Lafora bodies usually accumulate in the skin, muscle liver, and brain tissues. Therefore, the diagnosis can be obtained by performing a biopsy from any of these organs, but the most commonly used and accessible site with high yield is the axillary skin region.
- It is classified as a glycogen metabolism disorder with no cure.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Lafora Disease

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 378:

A 37-year-old woman presents to the clinic for a follow-up. She has a past medical history of papillary thyroid cancer, which was diagnosed 3 years ago, treated with total thyroidectomy and I-131 ablation (35 mCi I-131). Her thyroglobulin level and neck ultrasounds have been negative so far, including this visit. The most recent neck ultrasound demonstrates a 1.3 cm round lymph node on the left level III location. The patient is prepped with a low iodine diet and thyrotropin-alfa to obtain an I-131 whole-body scan. The study shows an uptake on the left breast and the lateral 8th rib. Physical examination reveals mild tenderness on the left breast outer quadrant and the lower ribs. Upon further inquiry, the patient remembers having a fall about 3 weeks ago on the stairs, which did not require any specific medical attention except some over the counter pain medicine. Which of the following best explains the increased iodine uptake on the I-131 whole body scan?

## Choices:

1. Thyroid cancer metastasis
2. Trauma-related inflammation on the breast tissue and a possible healing rib fracture
3. Contamination of iodine or iodine-containing secretions
4. Ectopic thyroid tissue

## Answer: 2 - Trauma-related inflammation on the breast tissue and a possible healing rib fracture

## Explanations:

- During the radioactive iodine scan, any normal or differentiated thyroid cancer tissue expected to pick up iodine. Infectious, cystic, and acute inflammatory lesions may also show iodine uptake or accumulation.
- Increased blood flow and capillary permeability lead to diffusion of tracer to the extracellular fluid. The patient has most likely trauma related lesion on her breast and injured rib, which presented with false-positive uptake.
- Similarly, contamination with body fluids after I-131 administration may also show uptake, which is usually recognized with a pattern of distribution and clears after decontamination.
- Any iodine uptake in the whole body scan should be evaluated carefully and correlation with thyroglobulin level, the physical exam should be sought. Patient's other medical problems and acute intervening conditions also should be considered when there is an unexpected result. Ectopic thyroid tissue may be seen in multiple locations in the body, including lingual, thymic, along the gastrointestinal tract, ovarian, and it may pick up radioactive iodine. In this case, the likelihood of ectopic thyroid is low because her serum thyroglobulin is undetectable.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Iodine-131 Uptake Study

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 379:

A 25-year-old woman with American Thyroid Association (ATA) high-risk thyroid carcinoma presents to the clinic for her Radioactive Iodine (RAI) dose of 150 mCi I-131. She denies recent sexual activity and is currently on oral contraceptives. Her past medical history is significant for diabetes mellitus type 1 and a family history significant for endocrine neoplasia, including first degree relatives with parathyroid adenomas and prolactinomas. Which of the following is the most appropriate test to perform prior to RAI therapy?

## Choices:

1. Fingerstick glucose
2. Pregnancy test
3. Testing for MEN1 gene mutations
4. Testing for RET gene mutation

## Answer: 2 - Pregnancy test

## Explanations:

- The ATA recommends pregnancy testing for all women of childbearing age prior to RAI therapy regardless of sexual history and contraception use.
- The only two absolute contraindications for RAI therapy are pregnancy and breastfeeding.
- Radioiodine use in pregnancy is associated with miscarriage, infantile hypothyroidism, and poor neurocognitive development.
- Mutations in MEN1 and RET are associated with subtypes of multiple endocrine neoplasia (MEN), however, these hereditary neoplastic disorders are more frequently associated with medullary thyroid carcinoma, which is not responsive to radioiodine therapy.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### 131 I Sodium Iodide

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## Question 380:

A 55-year-old man with a past medical history of Hodgkin lymphoma, treated with chemotherapy, presents to the clinic for a follow-up visit. He denies weight loss, night sweats, hoarseness, dysphagia. Comprehensive metabolic panel and hematology values are within normal limits. However, the thyroid panel reveals free T4 levels of 5 pmol/L and TSH levels of 1 mlU/L. The patient recently underwent PET/CT for end of treatment evaluation, and images revealed increased diffuse uptake of the thyroid without evidence of any other site of uptake. Which of the following is the most accurate interpretation of this set of findings?

## Choices:

1. Medullary carcinoma of the thyroid
2. Primary differentiated carcinoma of the thyroid
3. Normal physiologic thyroid uptake
4. Chronic lymphocytic thyroiditis

## Answer: 4 - Chronic lymphocytic thyroiditis

## Explanations:

- The interpretation of incidental FDG uptake in the thyroid can be troublesome and requires a comprehensive approach, including clinical history and ancillary lab results, as well as an understanding of the metabolic and functional characteristics of the organ in both physiological and pathological states.
- Normal physiologic FDG uptake can be identified in PET/CT in several organs, including the thyroid. However, avid uptake would indicate increased metabolic activity in the gland that suggests infectious, inflammatory, or malignant processes.
- Avid FDG uptake distribution can be focal or diffuse. Focal distribution favors malignant etiology, and diffuse distribution suggests an inflammatory disease process, like chronic lymphocytic thyroiditis, especially in the setting of biochemically proven hypothyroidism.
- Avid focal FDG uptake can be seen in medullary and poorly differentiated carcinoma of the thyroid due to the elevated metabolic cellular rate characteristic of aggressive tumors. Differentiated carcinomas would not demonstrate avid uptake on PET/CT.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Nuclear Medicine PET/CT Thyroid Cancer Assessment, Protocols, And Interpretation

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## Question 381: A 26-year-old woman came to the clinic with a complaint of fatigue, constipation, hair loss for 2 months. The patient breastfeeds her 6-month-old daughter. The physical exam was positive for dry skin. The labs include thyroid-stimulating hormone of 7.1 and free T4 of 0.3. Which of the following diseases have similar histological features?

## Choices:

1. Graves disease
2. Subacute thyroiditis
3. Goiter
4. Hashimoto thyroiditis

## Answer: 4 - Hashimoto thyroiditis

## Explanations:

- Postpartum thyroiditis (PPT) is a destructive autoimmune condition occurring in the first year after delivery in women without a history of thyroid disease before pregnancy.
- Three clinical presentations have been suggested for postpartum thyroiditis (PPT). Transient hyperthyroidism (32% of patients). Transient hypothyroidism (43% of patients). Transient hyperthyroidism followed by hypothyroidism and then recovery, which is the classic form of PPT (25% of patients).
- Postpartum thyroiditis also is known as destructive thyroiditis associated with lymphocytic infiltration and histological features similar to that seen in Hashimoto thyroiditis; both are associated with particular human leukocyte antigen (HLA)-B and HLA-D haplotypes.
- Thyroid biopsies in women with postpartum thyroiditis show lymphocytic infiltration, with occasional germinal centers, and disruption and collapse of thyroid follicles (lymphocytic thyroiditis). Fine-needle aspiration biopsies reveal lymphocytes, thyroid follicular cells, and masses of colloid. During recovery, lymphocytic infiltration is still seen, and there may be some fibrosis, but the thyroid follicles are more typical.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Postpartum Thyroiditis

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 382:

A 49-year-old man with no significant past medical history presents with a lump in his neck. Thyroid ultrasound shows a 3.8 cm left thyroid nodule and multiple lymph nodes on the neck. Fine needle aspiration biopsies from both the thyroid nodule and the largest lymph node on the same side are consistent with papillary thyroid cancer. He undergoes total thyroidectomy and left modified neck dissection without any complications. Surgical pathology reveals tall cell papillary thyroid cancer. Adjuvant therapy with iodine-131 (I-131) after thyroid hormone withdrawal is recommended. The patient presents for nuclear medicine appointment and reports that he had a CT-scan 2 weeks ago during the evaluation for abdominal pain. What would be the best next step in management?

## Choices:

1. Schedule I-131 therapy as soon as possible
2. Schedule I-131 therapy in one month
3. Recommend low-iodine diet and schedule the I-131 therapy in 2 weeks
4. Recommend low Iodine diet for at least 2 weeks and check urine iodine before scheduling I-131 therapy

## Answer: 4 - Recommend low Iodine diet for at least 2 weeks and check urine iodine before scheduling I-131 therapy

## Explanations:

- Intravenous contrast contains a high load of iodine. When the body is super-saturated with iodine, treatment with radioactive iodine would be unsuccessful or with very limited effect since thyroid cancer cells would not express the affinity to take up and trap given radioactive iodine.
- The western diet is quite rich in iodine, and to increase the effectivity of iodine treatment or whole-body scan, a low iodine diet for at least two weeks is recommended.
- When the patient has a recent history of iodinated contrast study, the best way to assess the body's iodine status is to check a 24-hour urine iodine level. A urine iodine level of =100 is ideal and shows a low iodine diet, however, most of the experts are comfortable to proceed with the treatment when urine iodine is =150 ng/dl.
- Longer periods of low iodine diet may be needed.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Iodine-131 Uptake Study

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 383:

A 50-year-old man presents to an outpatient department with complaints of drowsiness, nausea, and sleepiness during his working hours. He has struggled with insomnia for more than two years. A month back, he started taking a dietary supplement containing a hormone, although he is unsure of the dosage. He mentions that the medication has significantly helped him with sleep, and he would like to continue taking it. What advice among the following would be most appropriate to give to this patient regarding his sleep medication?

## Choices:

1. Stop taking the supplement
2. Look for supplements with approval from the United States Pharmacopeia
3. Take alprazolam 0.5 mg daily instead
4. Continue taking the supplement

## Answer: 2 - Look for supplements with approval from the United States Pharmacopeia

## Explanations:

- Melatonin is an endogenous hormone naturally produced by the human body, and its synthetic counterpart is used in dietary supplements. It is considered as the first-line pharmacologic therapy for the treatment of insomnia by the American Academy of Family Physicians (AAFP).
- Although melatonin is relatively non-toxic, some mild side-effects that the patient may have are drowsiness, daytime sleepiness, headaches, and nausea. These may happen in patients taking higher doses or extended-release formulations.
- Melatonin supplements, although generally safe, are not regulated by FDA, and thus, concerns may arise about the actual concentration of these supplements in contrast to the labeled content.
- One way to be sure of the correct dosing is to look for supplements with approval from the United States Pharmacopeia (marked USP verified), an independent non-profit organization.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Melatonin

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 384:

A 35-year-old woman with no significant past medical history presents to her primary care provider with palpitations, weight loss, loose stools, and mood changes. She does not take any medications or over the counter supplements. On physical examination, she is tachycardic; she has asymmetric thyroid enlargement, fine tremor, increased deep tendon reflexes. Her labs show undetectable thyroid-stimulating hormone (TSH), and a free-T4 level of 3.0 ng/dl (normal range 0.7-1.5). The patient is diagnosed with hyperthyroidism and started treatment with methimazole. A thyroid uptake scan is ordered. When should the patient stop taking methimazole prior to the thyroid uptake scan?

## Choices:

1. 1 week
2. 2 weeks
3. 10 days
4. 3-5 days

## Answer: 4 - 3-5 days

## Explanations:

- To optimize uptake before radioactive thyroid uptake and scan, providers should discontinue intervening medications, including exogenous thyroid hormones and thioamides.
- Antithyroid medications also diminish the effect of I-131 treatment.
- The elimination of the medications depends on their half-life and the metabolism in the body.
- Methimazole is a thioamide, and it blocks the thyroid peroxide enzyme in the follicle cells. This enzyme generates thyroid hormones by oxidizing iodine with thyroglobulin, and it is the rate-limiting step. When this enzyme is blocked with medication, uptake of Iodine to thyroid cells diminish. The half-life of methimazole is 5-9 hrs, so discontinuation of the medicine is necessary at least three days before any radioactive iodine scan or I-131 treatment.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Iodine-131 Uptake Study

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 385:

A 54-year-old woman presents to the clinic with complaints of irregular menstrual cycles for the past two years. The intervals between her periods have been as long as 3 or 4 months. She denies painful cramps but notes that the periods are heavier than before the irregularity began. She denies pain during intercourse. She also notes that she has been gaining weight for the past year, estimating that she is 7 kg heavier than she was at her last annual checkup. Upon examination, she is 160 cm (5'3") tall and weighs 77 kg (170 lbs). Her face is round and flushed, and her weight is concentrated around her abdomen. Her arms and legs are comparatively thinner. Her breast and pelvic examinations are unremarkable, except for thick, reddish-purple streaks around her breasts. Her blood pressure is measured to be 160/100 mmHg. Laboratory findings show an abnormal overnight dexamethasone suppression test and high 24-hour urine free cortisol. Her adrenocorticotropic hormone (ACTH) level is 3 pg/mL (reference range >10 pg/mL). Which of the following sets of findings is most likely to be seen on the histology of the lesion most likely responsible for this patient's condition?

## Choices:

1. Various growth patterns of well-differentiated to anaplastic cells
2. Distinct cell borders, cells have abundant foamy cytoplasm reminiscent of zona fasciculata
3. Clusters of cells with enlarged lipid-rich cytoplasm
4. Cells are large with different cytoplasm, increased variation in nuclear size

## Answer: 1 - Various growth patterns of well-differentiated to anaplastic cells

## Explanations:

- Adrenocortical carcinoma (ACC) can present classically in three different forms. About one-third of them present with symptoms of hormonal excess, another third present with non-specific symptoms, and the last third are diagnosed with imaging studies when they present for other medical conditions.
- Hormonal excess could be due to hypercortisolism, hyperandrogenism, or both. Hypercortisolism (Cushing syndrome) can present as plethora (rounded face), diabetes mellitus, osteoporosis, purple striae on the abdominal wall, muscle weakness, truncal obesity, and muscle atrophy. Glucocorticoid-mediated mineralocorticoid receptor activation due to saturation of 11-beta-hydroxysteroid dehydrogenase 2 (HSD11B2) system can present with hypokalemia and hypertension. Malignant adrenal tumors usually present with a clinical presentation of hypercortisolism, rapidly progressing muscle weakness, and pronounced muscle weakness. Hyperandrogenism can present with male pattern baldness, virilization, hirsutism, and menstrual abnormalities.
- Various growth patterns of well-differentiated to anaplastic cells are the histologic findings in adrenal gland cancer.
- Adrenal adenoma has distinct cell borders with abundant foamy cytoplasm reminiscent of zona fasciculata, balloon cells. There are clusters of cells with enlarged lipid-rich cytoplasm.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Adrenal Cancer

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 386:

A 66-year-old man presents to the clinic accompanied by his daughter with a complaint of gradual onset of fatigue, anorexia, and constipation over the last five weeks. He also feels that he has been urinating more often and a larger volume. Over the last two days, he has experienced some confusion and lethargy. She also adds that her dad has a nagging cough with some tinge of blood that has not improved with over-the-counter medications and has lost 10 kg during that interval. He has a history of hypertension and for which he takes hydrochlorothiazide. He has been smoking 3 packs of cigarettes daily for 40 years and drinks socially. On physical examination, he appears somnolent and disoriented. His reflexes are reduced. Chest and cardiovascular examinations appear normal. Temporal wasting is noted. His serum calcium is 18.3 mg/dL, glucose 98 mg/dL, serum sodium 142 mEq/L, serum potassium 4.2 mEq/L. Which other metabolic abnormality do you expect in this patient given the underlying diagnosis?

## Choices:

1. Low phosphate levels
2. High phosphate levels
3. High sodium levels
4. Increased serum creatinine

## Answer: 1 - Low phosphate levels

## Explanations:

- This patient has an elevated serum calcium levels, polyuria, neurologic symptoms and a long history of smoking. The most likely diagnosis is humoral hypercalcemia of malignancy (HHM) from an underlying squamous cell carcinoma of the lung.
- PTHrP can be high in several malignancies such as squamous cell carcinoma of the lung, clear type renal cell carcinoma and even bladder cancer. Some cases of PTHrp have also been seen in breast and ovarian malignancies.
- Parathyroid hormone-related protein (PTHrP) is structurally similar to parathyroid hormone (PTH). It can act on the PTH-1 receptor, thus increasing sodium calcium levels via an increase in bone resorption. PTHrP can also lead to more reabsorption of calcium in the distal renal tubule. Phosphate level can drop with PTHrP as it can act on the proximal tubules and prevent the reabsorption of phosphate.
- Beta-HCG can be elevated secondary to large cell lung cancer. This can lead to gynecomastia in men.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Paraneoplastic Syndromes

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## Question 387:

A 50-year-old male presents to the clinic for a follow-up visit for hypertension. He has no complaints today. Medical history includes diabetes mellitus type 2 and obstructive sleep apnea. On his previous visit, his blood pressure was 140/90 and the patient was recommended to make lifestyle changes to help lower blood pressure. His only medication is metformin 500 mg twice daily, and he uses a CPAP nightly. Vital signs today are as follows: blood pressure is 143/87, heart rate is 81, respiratory rate is 16, and the patient is on room air with a saturation of 97%. Body mass index is 33. The physical exam is unremarkable. What is the mechanism of action of the recommended first-line antihypertensive therapy to lower blood pressure?

## Choices:

1. By blocking calcium entry in the vascular smooth muscle
2. Inhibiting the effects of the renin-angiotensin-aldosterone system
3. Blocking effects of epinephrine on beta receptors
4. Promoting loss of sodium in renal tubules

## Answer: 2 - Inhibiting the effects of the renin-angiotensin-aldosterone system

## Explanations:

- First line or pharmacological therapy are the angiotensin converting enzyme inhibitors (ACE inhibitors) or angiotensinogen receptor blockers (ARBs), which are considered to be keystone of antihypertensive treatment in diabetic patients
- ACE inhibitors and ARBS are conidered to be first line therapy for hypertensive patients with type 2 diabetes mellitus.
- ACE inhibitors and ARBS have found to significantly reduce blood pressure and heart failure and diabetic patients.
- These medications have shown protective effects in diabetic patients in the form of improving insulin sensitivity and insulin secretion.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### How Can I Help My Patients With Type 2 Diabetes Mellitus Minimize Cardiovascular Disease Risk?

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 388:

A 32-year-old female presents to the clinic for follow-up for weight management. She has a history of hypertension and prediabetes. She was started on metformin, but she could not tolerate it because of side effects, and metformin was stopped; she takes lisinopril for hypertension. She works as a physical therapist. She gained 25 pounds this year and weighs 185 pounds today. She exercises for one hour every day after work. She does yoga for relaxation, and she sleeps well. She finds her job meaningful and without stress. She read about the benefits of intermittent fasting and caloric restriction online. For the last two weeks, she has started intermittent fasting, and she eats two meals between 10:00 AM and 4:00 PM and fasts on Saturday. As a result, she notices that she feels more energetic. Which of the following is a potential physiologic effect of intermittent fasting and caloric restriction?

## Choices:

1. Increased leptin levels
2. Decreased adiponectin level
3. Decreased beta-hydroxybutyrate
4. Decreased sympathetic tone and increased parasympathetic tone

## Answer: 4 - Decreased sympathetic tone and increased parasympathetic tone

## Explanations:

- Intermittent fasting is a dietary approach where there are timed periods of fasting without any restriction of a particular macronutrient. However, the overall rationale for weight loss based on intermittent fasting relies on broad caloric restriction. Caloric restriction leads to reduced levels of leptin and increased levels of adiponectin.
- The beneficial effect of intermittent fasting relies on a similar premise of caloric restriction. Intermittent fasting leads to better glucose control. Intermittent fasting may be more sustainable over a long period than caloric restriction alone. Intermittent fasting and caloric restriction also have the added benefit of reducing oxidative stress. It has the potential to slow the progression of neurodegenerative diseases like Alzheimer's disease and Parkinson's. Intermittent fasting may also have added beneficial effects from the optimization of circadian rhythm and ketogenesis. Disturbance in circadian rhythm, for example, from shift work leads to metabolic disturbances increasing the risk of obesity, diabetes, metabolic syndrome, and cardiovascular disease.
- Caloric restriction leads to decreased energy intake, decreased free radical production by mitochondria, and decreased oxidative stress. Caloric restriction also leads to reduced inflammatory markers. For example, in a study of obese individuals with asthma, reduced inflammatory markers such as TNF alpha and brain-derived neutrophilic factors were significantly reduced after caloric restriction. In addition, intermittent fasting leads to increased beta-hydroxybutyrate, which has an anti-inflammatory effect.
- Intermittent fasting leads to lowering blood pressure by decreasing sympathetic tone and increasing parasympathetic tone. Increasing parasympathetic tone also leads to reduced levels of inflammatory cytokines. Intermittent fasting also has a positive impact on lipid levels. Caloric restriction may change the pace of aging by modulating SIRT1. Sirtuins (SIR-2: Silent information regulator 2) are recently discovered molecules that may be important in the physiology of aging. SIRT1 Increases in response to Caloric restriction. Upregulation of SIRT1 by caloric restriction contributes to increased insulin sensitivity and reduced inflammation, potentially through modulation of NF-k/TNF Alpha pathway(NK-Natural killer cells, TNF-Tumor necrosis factor).

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Dietary Approaches To Obesity Treatment

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report any questions that need improvement.

## Question 389: A 42-year-old woman presents to the clinic for follow-up of uncontrolled hypertension and type 2 diabetes. Currently, she is taking lisinopril and metformin. Her BMI is 42 kg/m2. Which of the following mechanisms is most likely responsible for worsening hypertension and diabetes in this patient

## Choices:

1. Altered circulatory levels of inflammatory cytokines
2. Decreased renal blood flow
3. Decrease in resistin and visfatin
4. Suppression of the thyroid glands

## Answer: 1 - Altered circulatory levels of inflammatory cytokines

## Explanations:

- Overweight and obese individuals have altered circulatory levels of inflammatory cytokines, such as IL-6, TNF-alpha, C-reactive protein (CRP), IL-18, resistin, and visfatin. These altered circulatory inflammatory markers play an important role in the pathophysiology of these diseases.
- Losing weight will help to reduce the inflammatory markers and positively affects chronic diseases.
- Resistin is supposed to be a link between obesity and diabetes.
- There is no direct link between suppression of thyroid and obesity.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Pathophysiology of Obesity

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## Question 390:

A 32-year-old male patient who is married complains that they are having difficulty in conceiving. He admits to an impairment in smell. On examination, he has a eunuchoid habitus, blood pressure of 110/65 mmHg, small testes, and decreased pubic hair. Preliminary investigations reveal low levels of testosterone, luteinizing hormone, and follicle-stimulating hormone; however, he has normal glucose, IGF-1, prolactin levels, and 24-hour urinary free cortisol. What is the most likely diagnosis?

## Choices:

1. Acromegaly
2. Prolactinoma
3. Kallmann syndrome
4. Cushing syndrome

## Answer: 3 - Kallmann syndrome

## Explanations:

- In patients with Kallmann syndrome, there is delayed or absent puberty with an impaired sense of smell. Also, they tend to have hypogonadotropic hypogonadism.
- Their biochemical workup reveals decreased follicle-stimulating hormone (FSH) decreased luteinizing hormone (LH), and reduced testosterone/estradiol due to a mutation in the Kal1 gene as the commonest genetic abnormality in males.
- In prolactinoma the patients have galactorrhoea and in females amenorrhea with prolactin levels greater than 100 ng/ml. Secondary hypogonadism can result from the gonadotropin-releasing hormone deficiency, prolactinoma, or a defect in the synthesis and or secretion of luteinizing hormone and follicle-stimulating hormone.
- Acromegaly is characterized by high growth hormone and IGF-1 levels and excessive growth with increase ring, shoe, or hat size. Patients with Cushing syndrome have central obesity, hypertension, diabetes mellitus, and moon facies.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hypopituitarism

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## Question 391: A case-control study of adult men and women is performed to determine the relationship of obesity to cancer. The data indicate an increased risk for cancers of the esophagus and kidney in subjects with a body mass index above 25 $kg/m^2$. Which of the following substances is most likely to contribute to the development of cancer in these subjects?

## Choices:

1. Adiponectin
2. Trans fat
3. Insulin-like growth factor (IGF-1)
4. Leptin

## Answer: 3 - Insulin-like growth factor (IGF-1)

## Explanations:

- IGF-1 increases in response to the hyperinsulinemia of obese persons, who are also more likely to have metabolic syndrome and type 2 diabetes mellitus.
- IGF-1 promotes cell growth as well as increased synthesis of estrogens and androgens that favor neoplastic transformation in cells.
- Adiponectin that is elaborated by adipocytes acts as an insulin-sensitizing agent that prevents hyperinsulinemia.
- Trans fats are derived from artificial hydrogenation of dietary fats and are atherogenic by increasing LDL cholesterol while decreasing HDL cholesterol.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Genetics and Obesity

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## Question 392:

A 65-year-old female immigrant presented with complaints of exertional dyspnea, anorexia, weight loss, and dizziness for the past three months. Laboratory analysis reveals normal serum levels of sodium and potassium. However, her serum cortisol level is low. What is the most likely diagnosis?

## Choices:

1. Addison disease
2. Adrenal metastasis from a small cell lung cancer
3. Tuberculosis of the pituitary gland
4. Congenital adrenal hyperplasia

## Answer: 3 - Tuberculosis of the pituitary gland

## Explanations:

- The laboratory values show normal mineralogical activity with decreased cortisol levels.
- This is in keeping with a diagnosis of a secondary adrenal insufficiency.
- Secondary adrenal insufficiency has normal mineralocorticoid activity because the zona glomerulosa produces mineralocorticoids that are not under the pituitary gland's influence.
- All the other answers choices are examples of primary adrenal insufficiency where the laboratory values would all reflect low levels because of primary damage occurring at the adrenal glands. Pituitary tuberculosis is a secondary cause of adrenal insufficiency.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Adrenal Insufficiency

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## Question 393: An asymptomatic patient is found to have hypercalcemia on routine laboratories. Serum calcium is 12.2 mg/dL and phosphate is 2.2 mg/dL. Complete blood count, electrolytes, albumin, and renal function are all normal. Select the most likely diagnosis.

## Choices:

1. Vitamin D toxicity
2. Breast cancer
3. Hyperparathyroidism
4. Multiple myeloma

## Answer: 3 - Hyperparathyroidism

## Explanations:

- The most common cause of hypercalcemia is hyperparathyroidism, especially in an asymptomatic patient.
- The second most common cause is cancer, but the levels tend to be higher and accompanied by symptoms.
- Breast cancer with metastases to bone is the most common malignancy to have this effect.
- Vitamin D intoxication can cause hypercalcemia and hyperphosphatemia but is very rare.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hypercalcemia

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## Question 394:

A 35-year-old lady presents to the outpatient department with the complaint of occasional mild to moderate frontal headaches over the past few months. She also gives a history of blurring of vision. She does not have galactorrhea or amenorrhea. She comes with a magnetic resonance imaging scan of the head, which shows a sellar lesion extending to suprasellar location and displacing the chiasm. Which of the following is the most sensitive ophthalmologic test for detecting optic pathway compromise secondary to this tumor?

## Choices:

1. Peripheral visual field testing
2. Central visual field testing
3. Examination of the fundus
4. Color vision testing

## Answer: 1 - Peripheral visual field testing

## Explanations:

- The patient is having a pituitary macroadenoma.
- The compression of the chiasm causes visual field abnormalities in a pituitary adenoma.
- The most sensitive test for detecting optic pathway compromise due to a pituitary tumor is peripheral visual field testing.
- Decreases in color perception are much less sensitive in the diagnosis of optic nerve compression.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Pituitary Cancer

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## Question 395:

A 42-year-old woman presents with a palpable neck mass. Her past medical history includes hyperlipidemia. Further investigation reveals a 1.5 cm thyroid nodule, and a biopsy of the nodule confirms medullary thyroid cancer. Her blood pressure was noted to be elevated during two of her clinic visits, with the systolic being above 160/110 mmHg on both occasions. It is recommended that she keep a log of her blood pressure at home, which shows that it ranges between normal and elevated levels during different times of the day. A CT of her abdomen demonstrates a large right adrenal mass. What is the most appropriate next step in the management of this patient?

## Choices:

1. Interventional radiology guided fine needle aspiration of the adrenal mass
2. Chemotherapy for presumed adrenocortical carcinoma
3. Close surveillance of adrenal mass, while proceeding with the management of medullary thyroid cancer
4. 24-hour urinary catecholamines or metanephrine

## Answer: 4 - 24-hour urinary catecholamines or metanephrine

## Explanations:

- Based on the fluctuating blood pressure, the patient could have adrenal medullary hyperfunction or pheochromocytoma. Checking for urinary or plasma catecholamines and their metabolites is the next best step to identify the underlying problem.
- The patient could have multiple endocrine neoplasia (MEN) 2a syndrome and needs to be evaluated for any underlying parathyroid tumors. This syndrome involves medullary thyroid tumors, pheochromocytoma, and parathyroid tumors.
- The patient is symptomatic from possible pheochromocytoma, and therefore, surveillance alone is not considered appropriate. Adrenocortical cancers are rare and cannot be diagnosed without tissue sampling, preferably adrenalectomy rather than fine-needle aspiration (FNA).
- FNA of pheochromocytoma is generally contraindicated for fear of inducing a hypertensive crisis.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Adrenal Metastasis

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## Question 396: A 67-year-old male patient with insulin-dependent diabetes due to a follow-up is unable to visit a clinician due to quarantine restrictions. His health care provider is with a health system, and electronic medical records are available. What is the preferred way for the patient and the doctor to communicate with each other?

## Choices:

1. Email
2. Phone
3. Telehealth
4. If this is not an emergency, wait until the quarantine is lifted

## Answer: 3 - Telehealth

## Explanations:

- People with diabetes need regular follow-up for monitoring or getting their prescriptions. Digital platforms will help the patient communicate with the provider. The preferred platform will be one that allows conversation in real-time.
- Digital health platforms have improved the monitoring of patients. This patient needs a follow-up. The best way is telehealth communication platforms that may be used. Such platforms may have patient portals, scheduling, and telemedicine.
- Telehealth platforms allow the doctor and patient to communicate in real-time, with the patient discussing any new signs and symptoms, and the doctor responding immediately. The doctor may approve the required prescription at the same time. Documentation is completed just as in a regular examination.
- While a regular follow-up in some cases may not be necessary, the patient is an insulin-dependent diabetic and may need filling up of the prescription. Email is not a secure platform, and the patient will need to wait for a response. Traditionally, the telephone was used for emergency consultations. This is still a good alternative since most clinics provide phone numbers for patients to call in an emergency or urgent situation. Waiting is not the best option since the patient, and the provider has other avenues to communicate.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Digital Health

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## Question 397:

A 57-year-old man with a history of Hurthle cell carcinoma presents to the office with cough and dyspnea. He was diagnosed with Hurthle cell carcinoma about a year ago for which he underwent thyroidectomy. He has been on TSH suppressing levothyroxine replacement therapy since then. Surveillance scans 3 months prior to admission showed no evidence of disease. A current CT scan is suggestive of multiple pulmonary metastases. Which of the following is the next best step in the management of this patient?

## Choices:

1. Lenvatinib
2. Cytotoxic chemotherapy
3. Radioactive iodine therapy
4. Nivolumab

## Answer: 3 - Radioactive iodine therapy

## Explanations:

- Hurthle cell carcinomas traditionally have poor radioactive iodine (RAI) uptake, and radioactive iodine treatments are useful only in those tumors with RAI uptake, which is reported to be less than 10% of Hurthle cell carcinomas.
- Since this patient has metastatic Hurthle cell carcinoma, he needs systemic treatment.
- However, if RAI imaging is either not available or not done, it is recommended to pursue RAI treatment in Hurthle cell carcinomas with systemic disease or in high-risk adjuvant setting.
- Lenvatinib would be the next best option if the patient has radioactive iodine imaging and is not iodine avid or progresses despite having RAI treatment.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hurthle Cell Thyroid Carcinoma

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## Question 398:

A 57-year-old man presents to the clinic with a complaint of a left foot ulcer that he first noticed 4 weeks ago. He has a history of type 2 diabetes mellitus and hypertension. His current medications include enalapril, aspirin, metformin, and linagliptin. He has a 30 pack-year smoking history but does not use illicit drugs or drink alcohol. The patient is afebrile. His blood pressure is 125/80 mm Hg, and his pulse is 80/min. On physical examination, a 1.2 x 2 cm ulcer on the plantar surface of the great toe is seen. Which of the following is the next best test to evaluate the patient's risk of developing foot ulcers?

## Choices:

1. Monofilament test
2. Ankle-brachial index
3. Walk test
4. Capillary refill time

## Answer: 1 - Monofilament test

## Explanations:

- Diabetic neuropathy is usually the most common reason for diabetic foot ulcers.
- Neuropathy decreases pain and pressure sensations which can also lead to foot deformities. Neuropathic ulcers are usually located on the bottom of feet under the bony prominences, such as metatarsal head and heel.
- Peripheral sensory neuropathy can be assessed by testing for the pressure sensation by a 10g monofilament test.
- Diabetic ulcers may also occur due to vascular disease, but arterial ulcers are usually located on the tip of toes rather than the plantar surface of the feet. The ankle-brachial index is used to assess peripheral artery disease. However, ABI is mainly an assessment of large vessel PAD and does not measure accurately small vessel disease, which mostly contributes to diabetic ulcers. The 6-minute walk test is a functional assessment, typically used for patients with chronic heart and lung disease. Capillary refill time is also used for the peripheral arterial disease assessment. However, delayed capillary refill time (>3 seconds) is a non-specific finding and also indicates low volume or hypotension.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Diabetic Ulcer

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## Question 399:

A 65-year-old man is called to the clinic after one of his lab reports revealed his calcium level of 10.8 mg/dl, which was up from 9.4 mg/dl two years ago. The patient denies any symptoms. He has a past medical history of hypertension and asthma. He does not have any significant family history of any disease. His medications include aspirin, amlodipine, hydrochlorothiazide, and vitamin D. The patient denies smoking or taking drugs. On physical examination, the patient is alert and oriented. He is afebrile and hemodynamically stable. His neck is supple, and thyroid is not enlarged. Lab work reveals calcium levels of 10.8 mg/dl, phosphorus 2.5 mg/dl, PTH of 76 pg/ml, 25 hydroxyvitamin D of 27 ng/ml, and creatinine of 1.1 mg/dl. Which of the following is the most likely cause of hypercalcemia in this patient?

## Choices:

1. Thiazide
2. Malabsorption in the gut
3. Adenoma in the parathyroid gland
4. Hypercalcemia of malignancy

## Answer: 3 - Adenoma in the parathyroid gland

## Explanations:

- PTH normally increases the renal tubular reabsorption of calcium but reduces the renal tubular reabsorption of phosphate.
- A good pneumonic to remember the function of parathyroid hormone (PTH) is to remember "phosphate trashing hormone."
- An adenoma in the parathyroid gland leading to over secretion of PTH appears to be the cause of this patient's abnormal lab values and requires imaging to confirm the diagnosis.
- Thiazides are known to increase reabsorption of calcium in the distal convoluted tubules of kidneys, but they rarely cause frank hypercalcemia in the absence of primary hyperparathyroidism. Secondary hyperparathyroidism occurs when there is an underlying condition leading to a tendency towards hypocalcemia, most commonly vitamin D deficiency (can be due to gut malabsorption) or renal dysfunction.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Primary Hyperparathyroidism

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## Question 400: A 42-year-old woman presents after a motor vehicle collision. Her vitals include a blood pressure of 102/68 mmHg, pulse 109/min, and respiratory rate 24/min. Radiographs show a calcaneal fracture lucency extending to the intraarticular space anterior to the calcaneus. Which of the following hormones tend to favor bone resorption as the cumulative response?

## Choices:

1. Growth hormone and calcitonin
2. Glucocorticoids and growth hormone
3. Glucocorticoids and parathyroid hormone
4. Glucocorticoids and thyroid hormone

## Answer: 3 - Glucocorticoids and parathyroid hormone

## Explanations:

- Glucocorticoids and parathyroid hormone (PTH) tend to favor bone resorption as the cumulative response. Glucocorticoids decrease bone formation by favoring the survival of osteoclasts and causing cell death of osteoblasts.
- When there is a decreased concentration of plasma calcium, there is less binding to calcium-sensing receptors (CaSR) on the parathyroid gland. This leads to an increased release of PTH to raise calcium levels.
- PTH has an indirect action on the osteoclasts by increasing the activity of the receptor activator of nuclear factor-kappa ligand (RANKL), which regulates the osteoclastic activity of bone resorption and leads to more calcium released into the plasma.
- Growth hormone (GH), a peptide hormone secreted by the pituitary gland, acts through insulin-like growth factors to stimulate bone formation and resorption. GH acts directly and indirectly via the insulin-like growth factor to stimulate osteoblast proliferation and activity, but it also stimulates the bone resorption activity of osteoclasts; however, the cumulative net effect of this dual activity favors bone formation. Thyroid-stimulating hormone (TSH), thyroxine (T4), and triiodothyronine (T3) cause bone elongation at the epiphyseal plate of long bones through chondrocyte proliferation and also stimulate osteoblast activity. In states of hypothyroidism or hyperthyroidism, the degree of bone turnover is low and high, respectively. The rate of bone turnover is due to the effect of T3/T4 on the number and activity level of osteoblasts and osteoclasts. For example, the high metabolic state of thyrotoxicosis causes increased osteoblast function and increased osteoclastic number and activity and leads to greater bone turnover.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Physiology, Bone Remodeling

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## Section 5

Question 401: A 4-week-old boy is brought to the emergency department (ED) with complaints of altered consciousness and vomiting. His vital signs show a heart rate of 110 beats per minute, blood pressure of 70/45 mmHg, respiratory rate of 12 breaths per minute, and a temperature of 99°F. The physical examination shows dry mucosa. His labs reveal a serum sodium level of 125mmol/l, potassium 6 mmol/l, and blood sugar 50 mg/dl. The clinicians treat him for adrenal dysfunction in the ED. Later his MRI reveals adrenal hypoplasia. What would be the expected morphologic changes seen in this case of primary adrenocortical hypofunction?

### Choices:

1. An increase in the amount of sparsely granulated basophils.
2. A decrease in the amount of sparsely granulated basophils.
3. A larger population of acidophil cells.
4. A smaller population of acidophil cells.

## Answer: 1 - An increase in the amount of sparsely granulated basophils.

## Explanations:

- The adrenocorticotropic hormone (ACTH) hormone appears to be elaborated by sparsely granulated basophils.
- A primary lesion of the adrenal cortex results in a greater demand for the trophic hormone ACTH. This results in an increase in sparsely granulated basophils.
- An acidophil is a term used to describe somatotrophs and mammotrophs found in the anterior pituitary.
- Acidophils are identified as such because they can not be distinguished from each other under standard staining techniques. They can, however, be distinguished from basophils and chromophobes.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Adrenal Hypoplasia

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## Question 402:

A 16-year-old male patient presented with a complaint of generalized abdominal pain, vomiting, and fever for the last 24 hours. There are yellowish skin lesions present on his elbows and knees for the last 2 months. The abdominal pain radiates to his back and gets worse after eating. His vitals show a blood pressure of 110/70 mmHg, a pulse of 116 beats per minute, a respiratory rate of 24 breaths per minute, and a temperature of 101 F (38.3 C). On physical examination, there is generalized abdominal tenderness, muscle guarding, and distention, and his liver span is increased by 3 centimeters. There are yellow papules on both of his elbows and both of his knees. His serum has a milky appearance. Laboratory investigations reveal a serum lipase level of 600 units/liter and a fasting triglyceride level of 1100 mg/dL. What is the most likely diagnosis?

## Choices:

1. Acute pancreatitis
2. Hyperchylomicronemia
3. Acute cholecystitis
4. Gallstone pancreatitis

## Answer: 1 - Acute pancreatitis

## Explanations:

- Type 1 hyperchylomicronemia is an autosomal recessive disorder, which is a subtype of familial dyslipidemias. It occurs due to lipoprotein lipase or apolipoprotein C-2 deficiency. It is characterized by extremely elevated triglyceride and chylomicron levels. A triglyceride level of more than 1000 mg/dL increases the risk of pancreatitis in these patients.
- Chylomicrons usually clear from the blood after a meal in one to five hours, but they do not clear from the blood if the level is more than 1000 mg/dl. Triglycerides obstruct small blood vessels resulting in ischemia. Vessel damage exposes triglycerides to pancreatic lipases causing them to break down into free fatty acids. Free fatty acids cause tissue injury resulting in pancreatitis.
- A patient presenting with pancreatitis secondary to lipoprotein lipase deficiency will have a raised triglyceride and chylomicron level. Chylomicrons form a creamy layer at the top of a serum vial or a test tube.
- A patient with type 1 hyperchylomicronemia mostly presents with eruptive or pruritic xanthomas on numerous parts of their body. Hepatomegaly and steatosis are mainly due to fatty infiltration. Treatment consists of decreased intake of dietary fats along with lipid-lowering drugs.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Lipoprotein Lipase Deficiency

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## Question 403:

A 16-year-old patient comes to the emergency department with fatigue, polyuria, vomiting, and drowsiness for the past 2 days. He has no past medical history except for a URTI which he has for a week. He is a high school student and was studying for his finals. He does not smoke, drink alcohol, or ingest illicit drugs. Family history includes Graves's disease in his aunt. His blood pressure is 100/60 mmHg, the temperature is 99 F ( 37.2 C), the pulse is 110 bpm and respirations are 23/min. Physical examination shows signs of dehydration. The abdomen is tender to palpation and soft. CVS and chest examinations are unremarkable. CBC shows WBC 12000/mm3, Hb 12.5 mg/dl and platelets 250,000/mm3. The metabolic panel shows RBS 315 mg/dl, Na 135 mEq/L, K 4.5 mEq/L, cl 100 mEq/L, ph 7.3, and HCO3 15 mEq/L. Urinalysis shows ketonuria and glucosuria. Which of the following abnormalities should be corrected?

## Choices:

1. Hyperglycemia
2. Metabolic acidosis
3. Glucosuria
4. Ketonuria

## Answer: 2 - Metabolic acidosis

## Explanations:

- The patient in the given scenario has symptoms and laboratory abnormalities pointing towards undiagnosed diabetes mellitus type 1. He is currently acidotic. Diabetic ketoacidosis is often the presenting symptom of diabetes mellitus type 1. The URTI likely was the predisposing factor for the patient to develop ketosis.
- The patient has a high anion gap which can be calculated using the formula Sodium - (Chloride + Bicarbonate). His anion gap is 20 (8-10). Metabolic acidosis is evidenced by low serum bicarbonate and low pH. The patient high anion gap metabolic acidosis should be corrected first.
- He should be started on intravenous saline infusion, insulin infusion, and potassium supplementation. His RBS and vitals should be evaluated periodically.
- RBS , glucosuria, and ketonuria will start to normalise as the metabolic acidosis improves.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### High Anion Gap Metabolic Acidosis

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## Question 404: A 52-year-old man with diabetes mellitus presents for an annual check-up. He has been taking metformin for the last eight years. On examination, he is found to have an average blood pressure of 160/90 mmHg on multiple separate measurements. What is the most appropriate next step?

## Choices:

1. Ambulatory blood pressure monitoring
2. Start hydrochlorothiazide and follow-up in 2 weeks
3. Start an ACE inhibitor and follow-up in 2 weeks
4. Advise lifestyle modifications and follow-up at the next annual check-up

## Answer: 3 - Start an ACE inhibitor and follow-up in 2 weeks

## Explanations:

- ACE inhibitors are indicated as the drug of choice for treating hypertension in patients with coexistent diabetes mellitus.
- American College of Cardiology and American Heart Association guidelines recommend starting antihypertensive therapy at a blood pressure of 130/80 mmHg or above in patients with additional risk factors for atherosclerotic cardiovascular disease (ASCVD).
- Experimental and epidemiological data suggest that activation of the renin-angiotensin-aldosterone system plays an important role in the microvascular and macrovascular complications in patients with diabetes mellitus.
- ACE inhibitors have been reported to improve renal, cardiac, and to a lesser extent, eye and peripheral nerve function of patients with diabetes mellitus.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Diabetes Mellitus

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## Question 405:

A 40-year-old man with a recent myocardial infarction presents to the clinic for evaluation. A review of his chart reveals persistently elevated LDL-cholesterol and total cholesterol. He has tried rosuvastatin and atorvastatin in the past with poor response. His cholesterol levels improved mildly when he took ezetimibe. Which of the following best describes the patient's poor response to statins?

## Choices:

1. Elevated campesterol and elevated stigmasterol
2. Elevated campesterol and low stigmasterol
3. Low campesterol and high sitosterol
4. Low campesterol and low sitosterol

## Answer: 1 - Elevated campesterol and elevated stigmasterol

## Explanations:

- Phytosterols that would be elevated in beta-sitosterolemia include sitosterol, campesterol, stigmasterol, and cholesterol.
- Cholestanol is a stanol, not a sterol, and is derived from animals.
- Because statins do not work appropriately for those with sitosterolemia, one would expect persistently elevated levels of total cholesterol from the plant sterols that are ineffectively cleared.
- When using a plant sterol panel to diagnose sitosterolemia, it is important to know how to interpret the results.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hereditary Sitosterolemia

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## Question 406:

A 46-year-old female complains of progressive fatigue, weakness, and weight gain. She has no significant past medical history. Exam shows an obese female with fat deposition at the posterior neck, face, and trunk. Purple striae are present over the abdomen. Which test result is expected?

## Choices:

1. Hypoglycemia
2. Hyperglycemia
3. Metabolic acidosis
4. Hyperkalemia

## Answer: 2 - Hyperglycemia

## Explanations:

- Patients with Cushing syndrome tend to have hyperglycemia and a hypokalemic metabolic alkalosis.
- Cushing syndrome is caused by prolonged exposure to high circulating levels of cortisol. Adrenocorticotropic hormone (ACTH)dependent cortisol excess due to a pituitary adenoma is called Cushing disease. There are two main etiologies of Cushing syndrome: Endogenous hypercortisolism and exogenous hypercortisolism.
- Patients may have history of weight gain, fatigue, weakness, delayed wound healing, easy bruising, back pain, bone pain, loss of height, depression, mood swings, emotional reactivity, loss of libido, erectile dysfunction in males, irregular menstrual cycles in females, infertility, hyperhidrosis, hirsutism, and difficulty in combing hair or rising from sitting position. Patients may also have a history of hypertension and diabetes mellitus.
- The best initial test for diagnosis of Cushing syndrome is 24-hour urinary cortisol estimation. Alternatively, midnight serum or salivary cortisol levels or a low dose dexamethasone suppression test can be used to confirm hypercortisolism. MRI pituitary gland, unenhanced CT scan of adrenals, and chest x-ray and CT are also obtained to localize the pathology.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Cushing Syndrome

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## Question 407:

A 30-year-old male with a past medical history of Addison disease and hypothyroidism comes to the physician with a new onset of an itchy rash on both his knees for the past 2 weeks. He has been taking hydrocortisone, fludrocortisone, and levothyroxine. The rash consists of multiple small scattered erythematous papules and vesicles. She denies fever, chills, weight loss, night sweats, cold sensitivity, or palpitations. Currently, he is afebrile and hemodynamically stable. Physical examination is normal apart fro erythematous papules and vesicle on both his knees. Lab work includes leukocyte count of 7700 cells/mm3, hemoglobin of 11 g/dl, hematocrit of 31%, mean corpuscular volume (MCV) of 76 fl, TSH of 3.3 microU/L, and 25-hydroxy vitamin D of 10 ng/ml. The patient has been diagnosed with autoimmune polyglandular syndrome type 2. Which of the following is the most appropriate next step in the management of this patient?

## Choices:

1. Tissue transglutaminase immunoglobulin IgG
2. Tissue transglutaminase immunoglobulin IgE
3. Tissue transglutaminase immunoglobulin IgA
4. Measurement of antinuclear antibody

## Answer: 3 - Tissue transglutaminase immunoglobulin IgA

## Explanations:

- Autoimmune polyglandular syndrome (APS) type 2 is diagnosed by the presence of Addison disease together with either hypothyroidism or type 1 diabetes mellitus. Patients with APS should be assessed for associated conditions like celiac sprue, especially when dermatitis herpetiformis rash is suspected.
- Dermatitis herpetiformis is a chronic, autoimmune, blistering disease that causes an extremely pruritic rash that predominantly affects the extensor surfaces. The characteristic vesicles are often not apparent as they are destroyed by excoriation. The disease is closely associated with gluten-sensitive enteropathy (GSE); both conditions are characterized by the development of IgA autoantibodies against transglutaminases that, in the case of dermatitis herpetiformis, are deposited in the superficial papillary dermis.
- The cornerstone of long-term dermatitis herpetiformis management is strict adherence to a gluten-free diet. Not only does this improve skin changes over time, but it is also essential in the management of associated gluten-sensitive enteropathy. Patients are best managed in consultation with an experienced dietitian who will be able to provide appropriate support, as maintenance of a strict gluten-free diet can be challenging
- Sulphonamide drugs have utility in dermatitis herpetiformis, including sulphamethoxypyridazine, sulphapyridine, and sulphasalazine. They may be of utility in patients intolerant of dapsone. Systemic corticosteroids are of little benefit, though potent topical corticosteroids may be of use in the short term to lessen pruritis.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Dermatitis Herpetiformis

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## Question 408:

A 42-year-old woman is being evaluated for a thyroid nodule which was incidentally on a CT chest. She does not have any symptoms suggestive of hyperthyroidism or hypothyroidism. Ultrasound of the thyroid gland shows a 4 cm solid, isoechoic thyroid nodule with no suspicious features. A thyroidectomy is performed. Pathology is consistent with a 2 cm of focus of papillary thyroid cancer with no extrathyroidal extension, vascular or lymphatic extension. On a one-year follow-up, thyroglobulin is elevated at 20 ng/mL, and TSH is within normal limits. A radioiodine thyroid uptake scan reveals no foci of increased uptake. Which of the following is the next best step in the management of this patient?

## Choices:

1. Ultrasound of the neck
2. Radioiodine ablation
3. PET scan
4. Thyroid peroxidase antibody test

## Answer: 2 - Radioiodine ablation

## Explanations:

- The first line of treatment of papillary thyroid cancer is surgery (thyroidectomy).
- Thyroglobulin is a substance co-secreted with thyroid hormone. Post thyroidectomy and radioiodine ablation thyroglobulin can serve as a marker for tumor recurrence.
- Radioiodine ablation can help detect recurrence or metastasis in thyroid cancer.
- Radioiodine ablation is used in the adjuvant treatment of thyroid cancer wherein there is biochemical evidence of recurrence of thyroid cancer (elevated thyroglobulin) but none on imaging.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Nuclear Medicine Endocrine Assessment, Protocols, And Interpretation

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## Question 409:

A 40-year-old male patient with a past medical history of hypertension presents for a follow-up visit with his primary care physician. He was diagnosed a couple of months ago with type 2 diabetes in his previous visit to the clinic, managed with exercise, diet, and metformin. He is compliant with his medication, diet and exercise regimen. Physical exam BP 138/88, pulse 80, respiratory rate 18, rest of the physical exam is unremarkable. Labs are Hb 14, Hct 39, fasting glucose 160, HbA1c 8, Na 140, K 4, BUN 18, creatinine 1.0. Which of the following is the best next step regarding his metabolic treatment?

## Choices:

1. Add glipizide 2.5mg and increase the dose in a response-dependent manner
2. Initiate insulin treatment
3. No further recommendations
4. Diet, exercise and follow up in 4 weeks

## Answer: 1 - Add glipizide 2.5mg and increase the dose in a response-dependent manner

## Explanations:

- Glipizide is administered orally. Patients generally start on the lowest dose, with urine, and blood sugar regularly monitored to determine dosing efficacy. In many patients with type 2 diabetes, glipizide as sole therapy is inadequate to achieve blood sugar control. Glipizide is often used with other oral hypoglycemics for maximal benefit. The dose should be increased by 2.5 to 5 mg in a response-dependent manner, and several days should elapse between any dose changes. In some patients, dividing the dose twice a day may help, but this may also result in reduced compliance.
- Insulin will not be the correct drug at this moment, to decrease his glucose level. Glipizide is a sulfonylurea. It promotes insulin release from the pancreatic beta cells and reduces glucose output from the liver. It also improves insulin sensitivity at peripheral target sites.
- Despite the treatment initiated at his last visit, this patient is still in hyperglycemia, his fasting glucose and HbA1c are abnormal and requires the addition of another drug. Hemoglobin glycosylation (HbA1c) should be monitored every 3 to 6 months to ensure therapeutic patient compliance. In patients with mild hyperglycemia, glipizide may be used as monotherapy with changes in diet and exercise.
- Diet and exercise are essential in the management of type 2 diabetes; however, the patient has been compliant with diet, exercise, and medication and remains hyperglycemic. Glipizide is a second-generation sulfonylurea that is FDA-approved for the treatment of adults with diabetes mellitus type 2. It is to be administered as an adjunct to diet and exercise.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Glipizide

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## Question 410:

A 66-year-old man is diagnosed with a neuroendocrine tumor in the small intestine after undergoing a magnetic resonance image (MRI). He presented to the clinic for routine follow up. Presently, he is asymptomatic and vitally stable. An octreotide scan was advised by the provider which showed uptake of the tracer more than in the liver. Which of the following is the next course of management?

## Choices:

1. Peptide receptor radionuclide therapy
2. Positron emission tomography (PET) scan
3. Magnetic resonance image (MRI)
4. Histopathology is required

## Answer: 1 - Peptide receptor radionuclide therapy

## Explanations:

- Krenning score is used in grading uptake intensity of neuroendocrine tumors on somatostatin receptor imaging modalities like octreotide scan.
- The grading is as follows: grade 1: uptake less than a normal liver, grade 2: uptake equal to normal liver, grade 3: uptake greater than a normal liver, and grade 4: uptake greater than the spleen or kidneys.
- Typically PRRT is taken into consideration if this score is greater than 2.
- As the uptake is more than the liver, in this case, PPRT is indicated.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Octreotide Scan

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## Question 411:

A 62-year-old male with type two diabetes mellitus presents to the hospital for alcohol intoxication. He denies any other medical history or surgical history. He reports to drinking 2 glasses of vodka every night. His temperature is 98.6 degrees Fahrenheit, pulse 90 beats per minute, blood pressure is 150/100 mm Hg, respiratory rate is 18 times a minute and is blood oxygen saturation is 98%. On physical examination, he is lethargic and does not respond appropriately to commands. He has normal S1 and S2, no murmurs, no wheezes or crackles. His abdomen is soft, non-tender and non-distended. There is no edema or cyanosis on his extremities. On laboratory evaluation, the hemoglobin is 15 gm/dL and his white blood cell count is 7000/mcL. His blood glucose level is 110 mg/dl and his blood potassium level is 2.9 mmol/L. On the EKG, ST-segment depression and U waves are present. He is started on treatment for alcohol intoxication. He will be started on insulin soon. What medication must be administered to the patient before starting insulin in this clinical scenario?

## Choices:

1. Glucose
2. Normal Saline
3. Potassium
4. Lorazepam

## Answer: 3 - Potassium

## Explanations:

- The correct answer is 3, potassium. The patient already has hypokalemia. Insulin can worsen hypokalemia by causing potassium to shift to the intracellular compartment. Hence before the administration of insulin, potassium must be given to the patient.
- Insulin-induced hypokalemia can manifest as weakness, palpitations, arrhythmias, muscle cramping, altered mental status, gastrointestinal distress and involvement of other systems.
- Untreated hypokalemia can be life-threatening.
- On EKG evaluation, hypokalemia can present with ST-segment depression, flattening of the T wave and prominent U wave. Option choices 1, 2, and 4 are incorrect. The patient must be monitored for hypoglycemia while on insulin therapy. The patient does not have hypoglycemia currently as his blood glucose is 110 mg/dl. Since the patient comes in with alcohol intoxication, he must be monitored for alcohol withdrawal later on and may need lorazepam if there are signs and symptoms of alcohol withdrawal.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Human Insulin

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## Question 412:

A 48-year-old man has been complaining that his shoes no longer fit him and needs to buy larger sizes. He also states his old hats similarly do not fit him anymore. His family has been commenting that his facial features have been changing over the last couple of years when comparing old to new photos. On physical exam, he does have a coarsening of his facial features, acanthosis nigricans in his axilla, and skin tags. An IGF-1 level is elevated, and his GH level was less than 1 ng/mL after a 75 g glucose tolerance test. An MRI of his pituitary is performed next and does not reveal any mass. What is the next best step in his evaluation?

## Choices:

1. Proceed with medical management of acromegaly
2. CT chest and abdomen and a GHRH level
3. Repeat MRI in 6 months
4. Repeat IGF-1 level

## Answer: 2 - CT chest and abdomen and a GHRH level

## Explanations:

- The most common source of growth hormone excess is a pituitary adenoma. However, if one is not found in the presence of overt growth hormone excess, alternative sources need to be evaluated. Thus a CT scan of the chest and abdomen needs to be done.
- The purpose of the CT scan of the chest and abdomen is to look for tumors that may be a source of ectopic growth hormone production. Only 0.5% of growth hormone excess is due to ectopic causes. Some examples include bronchial carcinoid tumors, small cell lung cancer, pancreatic islet cell tumors, and adrenal adenomas.
- In addition to imaging, checking a growth hormone-releasing hormone level is reasonable. This level is usually markedly elevated in ectopic sources of growth hormone excess.
- Even though one must look for ectopic causes of growth hormone excess in the absence of a pituitary adenoma on imaging, the reality is that most patients actually do have a pituitary source of hormone excess that is perhaps too small to be picked up with conventional imaging.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Acromegaly

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## Question 413:

A 40-year-old woman is following up two weeks after undergoing total abdominal hysterectomy with bilateral salpingectomy and oophorectomy for dysfunctional uterine bleeding. She is a carrier of BRCA2, so it was decided to remove her ovaries and fallopian tubes at the time of hysterectomy, given the familial predisposition and increased risk of ovarian cancer. She feels well, and her surgical wounds appear to be healing. What recommendations should be given to the patient regarding hormonal therapy?

## Choices:

1. Hormonal therapy is not necessary for this patient since she is premenopausal.
2. Hormonal therapy is contraindicated in this patient due to her carrier status.
3. Hormonal therapy is contraindicated in this patient because it has been shown to have negative cardiovascular effects.
4. Hormonal therapy may be offered short-term to this patient to prevent the hypoestrogenic effects after oophorectomy.

## Answer: 4 - Hormonal therapy may be offered short-term to this patient to prevent the hypoestrogenic effects after oophorectomy.

## Explanations:

- Removal of the ovaries during hysterectomy removes the source of androgens that drive many of the physiologic processes of the female body.
- Premenopausal women who undergo prophylactic oophorectomy can experience hypoestrogenic effects soon after surgery, which usually occurs during menopause, such as hot flashes, fatigue, and vaginal atrophy.
- Hormonal therapy should be offered to women of premenopausal status who undergo removal of the ovaries in order to prevent many of the consequences of estrogen deficiency.
- Having the BRCA1 or BRCA2 gene is not a contraindication for estrogen therapy for up to four years, but the long-term impact is unknown.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Abdominal Hysterectomy

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## Question 414:

A 31-year-old Asian woman with a BMI of 29 kg/m$^2$ presents to the clinic to discuss weight loss. She has a history of depression and takes fluoxetine. She admits to taking higher doses of fluoxetine because she feels it helps her lose a few pounds. She says many providers have dismissed her concerns, saying she has 'body image issues,' but she continues to gain weight despite making dietary modifications. She has no concerning features of any eating disorder. History, physical examination, and blood work do not reveal any secondary causes of weight gain. She is advised lifestyle modifications and behavioral therapy. Which of the following is the next best step in the management of this patient?

## Choices:

1. Routine follow up
2. Increase the dosage of fluoxetine
3. Add liraglutide
4. Start bupropion-naltrexone and wean off fluoxetine

## Answer: 4 - Start bupropion-naltrexone and wean off fluoxetine

## Explanations:

- The patient is of Asian origin and meets the criteria for obesity per the WHO specific cut-off point for action of BMI of more than 27.5 kg/m2. Hence, she should be treated as a clinically obese patient with appropriate drug therapy with simultaneous lifestyle modification and behavioral therapy.
- The appropriate choice of drug for her is bupropion-naltrexone, as it will help her lose weight and help her tackle her depression simultaneously. Furthermore, the patient does not have an eating disorder which could be a potential contraindication to the use of bupropion-naltrexone.
- Fluoxetine is not an FDA-approved drug for the treatment of obesity and should not be further up titrated.
- Liraglutide is a good option for treating obesity; however, it does not treat her concurrent depression.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Non-dieting Approaches To Treatment Of Obesity

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 415:

A 17-year-old male comes in with his mother for a health maintenance exam. He has no complaints at this moment, and his vaccinations are up to date. The mother states that he is having problems with his school performance. His past medical history is insignificant. His blood pressure is 135/80 mmHg, pulse rate is 80 beats/minute, respiratory rate is 15 breaths/minute, and the temperature is 37.3 C (99.1 F). His physical examination reveals good bilateral air entry with regular S1 and S2. Gynecomastia is noted, and body hair is scarce. Both testicles are palpable in the scrotum, but small and firm. His serum testosterone is 150 ng/dl (normal range: 350-1030 ng/dl). Karyotyping has been advised. Which of the following is a histological feature of the most likely affected cells of testes?

## Choices:

1. Anuclear cells
2. Abundant lipid content
3. Abundant lysosomes
4. Absent mitochondria

## Answer: 2 - Abundant lipid content

## Explanations:

- This patient has most likely Klinefelter syndrome (KS), which is characterized by low testosterone levels, hypogonadism, gynecomastia, and infertility. Karyotyping shows 47 chromosomes with an extra X chromosome.
- One of the most common pathologies of Leydig cells is Klinefelter syndrome, where testosterone levels are usually low despite high levels of luteinizing hormone and abundant Leydig cells. The cells are abnormal and abundant, but no steroid precursors accumulation is noted, which excludes enzyme defects or deficiency.
- The primary source of testosterone or androgens in males is the Leydig cells. This physiology allows them to play a crucial role in many vital physiological processes in males, including sperm production or spermatogenesis, controlling sexual development, and maintaining secondary sexual characteristics and behaviors.
- Because these cells are responsible for testosterone production, they have features of steroid-secreting cells, which include large and well developed smooth endoplasmic reticulum, large and numerous lipid droplets.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Histology, Leydig Cells

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 416: A 43-year-old male with obesity and hyperlipidemia comes to the clinic after having a one-year history of polydipsia and polyuria that has worsened over the past two months. He does not like to see a clinician and dislikes taking medication. The testing of HbA1c reveals a value of 8.2%. The patient admits that recently he has become more sedentary after the lockdown due to COVID-19 and is interested in an exercise program. What type of exercise program would be best for this patient?

## Choices:

1. A vigorous aerobic exercise program
2. A gentle aerobic exercise program
3. A resistance training program
4. The patient should not participate in an exercise program

## Answer: 2 - A gentle aerobic exercise program

## Explanations:

- Sudden exercise in sedentary patients can precipitate myocardial infarction. In a patient newly diagnosed with diabetes mellitus and a previously sedentary lifestyle, a physical examination and a resting EKG are recommended before initiating an exercise program.
- Patients are encouraged to begin a gentle aerobic exercise program and gradually progress as tolerated.
- It also is recommended to assess these patients for cardiovascular disease risk factors such as dyslipidemia, hypertension, and smoking before initiating an exercise program.
- Exercise is considered a cornerstone of diabetes management.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Diabetes Mellitus And Exercise

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 417:

A 25-year-old man presents to the clinic to establish care. He has an extensive family history of obesity and dyslipidemia diagnosed in his father, grandfather, and several paternal uncles and aunts. He has a BMI of 43 kg/m$^2$. He works on a farm and is physically active. However, he eats a meat-rich diet with few vegetables. A physical exam reveals hepatomegaly with no evidence of irregular fat distributing or wasting. An initial set of investigations is shown below.

| | Patient value | Reference range |
|---|---|---|
| AST | 139 IU/L | 35 IU/L |
| ALT | 143 IU/L | 10-35 IU/L |
| Alkaline phosphatase | 134 IU/L | 44-147 IU/L |
| TSH | 1.3 microU/mL | 0.35-5.5 microU/mL |
| Random cortisol | 10.2 mcg/dL | 5-20 mcg/dL |
| HbA1c | 5.9% | 4%-6% |

Which of the following is the next best step in the management of this patient?

## Choices:

1. Liraglutide
2. Bariatric surgery
3. Genetic testing
4. Metreleptin

## Answer: 3 - Genetic testing

## Explanations:

- Since this patient is young, has an extensive family disease of obesity and dyslipidemia, and no prior medical records, it would be worthwhile to get genetic testing to look for mutations causing obesity.
- If the patient has a deficiency of POMC, PCSK1, or leptin receptor, he can be treated with setmelanotide, a melanocortin receptor 4 agonist, which works downstream of these deficiencies to treat obesity. It was FDA approved in November 2020 and can be dosed 2 mg daily subcutaneously for these specific groups of patients.
- The patient has indications of metabolic syndrome, including hepatomegaly and elevated transaminases signifying fatty liver disease setting in as well as an HbA1c in the prediabetic range of 5.9%. Liraglutide is one of the best medications to treat obesity and metabolic syndrome; however, this is a special case warranting further genetic testing before treatment can be started.
- Metreleptin is a once-daily subcutaneously administered FDA-approved drug used in patients with congenital or acquired lipodystrophy due to leptin deficiency. It requires confirmation of leptin deficiency and evidence of lipodystrophy (not present in our patient) and rigorous monitoring due to the boxed warning for the development of antibodies and lymphomas. Providers should not refer to bariatric surgery unless further genetic testing is complete because a medication like Setmelanotide is a better option in a young individual than bariatric surgery.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Non-dieting Approaches To Treatment Of Obesity

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 418:

A 30-year-old woman is referred to the hospital for living donor kidney transplantation. She has a past medical history of hypertension, hepatitis C, chronic renal insufficiency on hemodialysis. On physical exam, a 3x3 cm solid mass appreciated over the right tibia. On laboratory analysis, serum parathyroid hormone (PTH) level is 1,840.6 pg/dL, serum calcium 10.08 mg/dL, phosphorus 4.2 mg/dL, and alkaline phosphatase (ALP) 1,432 IU/L. Ultrasonography of the neck reveals no parathyroid mass; however, a scan with 20 mCi Tc-99-sestamibi shows increased uptake by the parathyroid glands. Histology examination of the bone lesion is consistent with a brown tumor. Which of the following best describes the most likely microscopic examination of the tissue?

## Choices:

1. Osteoblastic and osteoclastic activity, large osteoclasts with a large number of nuclei, numerous reversal lines, high degree of vascularity in intervening intertrabecular spaces
2. High-grade sarcoma with epithelioid, plasmacytoid, fusiform, ovoid, small-round, spindle, or clear cells, sometimes with multinucleated giant cells
3. Hypercellular sheets of cells with the diffuse distribution of large osteoclasts, necrosis, fibrosis/fibroplasia, foam cell aggregates, focal reactive osteoid
4. Lobules of plump fibroblasts, extravasated red blood cells, hemosiderin-laden macrophages, and osteoclast-type giant cells that cluster in areas of hemorrhage

## Answer: 4 - Lobules of plump fibroblasts, extravasated red blood cells, hemosiderin-laden macrophages, and osteoclast-type giant cells that cluster in areas of hemorrhage

## Explanations:

- Osteitis fibrosa cystica (OFC) is a skeletal disorder caused by an overproduction of parathyroid hormone (PTH) from the overactive parathyroid glands.
- The overactivity of the parathyroid glands called primary hyperparathyroidism (PHP) can be triggered by a parathyroid adenoma, hereditary factors, parathyroid carcinoma, or renal osteodystrophy.
- Osteitis fibrosa cystica is the result of the overproduction of parathyroid hormone (PTH) in the setting of primary, secondary, and tertiary hyperparathyroidism. The parathyroid hormone binds to receptors on surface osteoblasts, which express receptor activator of NF-kB (RANK) ligan. The RANK ligand binds to RANK on osteoclast precursors, inducing the formation of osteoclasts. activated osteoclast cells result in resorption with the destruction of cortical bone and the creation of fibrous cysts. The marrow may be replaced by vascularized fibrous tissue and osteoclast-like giant cells and eventually result in brown tumors. Brown tumors are considered to be non-neoplastic lesions. One of the earliest changes in brown tumors involves the demineralization of bone, leading to the activation of osteoclasts. As the bone resorption continues, microhemorrhages and microfractures occur.
- Histopathologically, there is a combination of osteoblastic and osteoclastic activity with cyst formation and numerous scattered hemosiderin-laden macrophages.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Osteitis Fibrosa Cystica

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 419:

A 60-year-old female was found in a semi-comatose condition and brought to the emergency department. On physical exam, her height was 66 inches (167.6 cm), and her weight was 123 lb (55.8 kg) (BMI=19.9 kg/m2). Her blood pressure was 80/40 mm; her pulse rate was 50 beats/min with a temperature of 32 C (89.6F). She was disoriented and lethargic. There was no palpable thyroid enlargement, but there was a scar on her neck. Laboratory test results demonstrate: hemoglobin 9 g/dl; hematocrit 25%; WBC count 9840 cells/mm3; platelet count 297,000 cells/mm3; creatinine 1.09 mg/dl sodium 126 meq/l; potassium 3.8 mEq/L; chloride 93 mEq/L; and bicarbonate 24.5 mEq/L. Chest radiography and CT brain didn't reveal any abnormalities. Blood and urine cultures were sent. The patient was started on intravenous fluid resuscitation with broad-spectrum antibiotics. Which of the following is most likely to be seen in the ECG of this patient?

## Choices:

1. ST depression and short QT interval
2. Peaked T wave and short QT interval
3. Low voltage ECG and long QT interval
4. Low voltage ECG and peaked T wave

## Answer: 3 - Low voltage ECG and long QT interval

## Explanations:

- The patient has myxedema coma with hypotension, bradycardia, and hyponatremia. Given the scar in her neck on physical exam, the most likely precipitating factor is untreated hypothyroidism acquired after thyroidectomy. Complete heart block, bradycardia, flattened T waves, low voltage, and bundle branch blocks are common ECG findings in these patients.
- Low voltage on EKG can be representative of pericardial effusion due to the accumulation of fluid rich in mucopolysaccharides.
- Fatal arrhythmias are important to recognize in myxedema coma. The patients can develop QT interval prolongations leading to “Torsades De Pointes” which resolves with treatment of the myxedema.
- Myxedema causes decreased myocardial contractility and reduced cardiac output which leads to hypotension.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Myxedema

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## Question 420:

A 29-year-old woman presents with an 8-month history of loss of libido, nausea, and irregular menstrual periods. She has also noticed a white milky substance leaking from her nipples during this time. Her past medical history includes generalized anxiety disorder and a traumatic brain injury after a motor vehicle accident one year ago. She takes sertraline and buspirone. Vital signs show blood pressure is 120/82 mmHg, heart rate 80 beats per minute, respirations 16 per minute, and temperature 98.0 F. A urine human chorionic gonadotropin (beta-HCG) test is negative. Which of the following is the most likely cause of the patient's symptoms?

## Choices:

1. Medication-induced hyperprolactinemia
2. Pituitary stalk transection
3. Prolactinoma
4. Pregnancy

## Answer: 2 - Pituitary stalk transection

## Explanations:

- Prolactin is an important protein hormone that is in charge of milk production, and also contributes to breast development.
- A high level of prolactin can turn off the hypothalamic-pituitary-gonadal axis by inhibiting the release of gonadotropin-releasing hormone. GnRH, normally, stimulates the release of follicle-stimulating hormone and luteinizing hormone in the anterior pituitary, which acts on the reproductive system to start the menstrual cycle. Thus, hyperprolactinemia is one of the causes of menstrual irregularities and infertility.
- The pathophysiology of prolactin can include either lack of prolactin production or excessive prolactin production. Prolactin deficiency results in failure to lactate while excessive prolactin results in galactorrhea and infertility. Destruction of the anterior pituitary can cause prolactin deficiency. On the other hand, prolactin excess causes include loss of dopamine inhibition under the influence of antipsychotic drugs or the destruction of the hypothalamus or hypothalamohypophyseal tract. Prolactin-secreting tumors can also cause prolactin excess as the case with prolactinoma.
- Prolactin-related pathologies are either associated with prolactin deficiency or prolactin excess. Examples include medication-induced prolactinoma (generally from antipsychotics), prolactinoma, Sheehan syndrome, tumors, infection, or infiltration processes. In this past, the patient has a history of a traumatic brain injury and likely had a pituitary stalk transection disrupting tonic dopamine inhibition of prolactin levels.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Physiology, Prolactin

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## Question 421: In women, androgen excess causes hirsutism and androgenic alopecia of the scalp. Select the best reason for the different effect of androgens on different areas.

## Choices:

1. Areas that are exposed to the sun are less androgen sensitive
2. Scalp follicles exposed to androgen excess spend less time in the growth phase
3. Scalp androgen levels are lower than in other parts of the body
4. Hirsutism causes psychological stress, which in turn causes male pattern balding

## Answer: 2 - Scalp follicles exposed to androgen excess spend less time in the growth phase

## Explanations:

- The hair growth cycle consists of growth, involution, and rest.
- Androgens cause increased hair growth in most androgen-sensitive sites.
- Hair loss occurs on the scalp because the hair spends less time in the growth phase.
- Androgen levels are uniform throughout the body.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Androgenetic Alopecia

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## Question 422: A 65-year-old male patient presents with diarrhea, excessive thirst, urination, and hunger. He states that he has to wake up at night multiple times because of the frequency of micturition. There is significant unintentional weight loss. On examination, there is a crusty and severely erythematous skin rash spreading in a centrifugal pattern. His lab work reveals a fasting blood sugar of 190 mg/dL. Which of the following is the associated rash?

## Choices:

1. Eczematous dermatitis
2. Necrolytic migratory erythema
3. Acrokeratosis paraneoplastica
4. Erythrokeratoderma

## Answer: 2 - Necrolytic migratory erythema

## Explanations:

- Symptoms of glucagonoma, a tumor of the pancreatic islets, are the development of a reddish-brown rash on the skin (necrolytic migratory erythema) red-orange tongue, cracks on corners of the mouth, and scaling rash.
- The presence of a glucagonoma is characterized by glucagon overproduction, new-onset diabetes, weight loss, anemia, hypoaminoacidemia, and necrolytic migratory erythema.
- Another classic presentation of glucagonoma syndrome is a high incidence of thromboembolic complications and pulmonary embolism.
- Glucagonoma is often found during autopsy as a solitary nodule in elderly people.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Necrolytic Migratory Erythema

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## Question 423:

A 55-year-old male presents to the gastroenterology clinic with complaints of persistent diarrhea. He has had multiple episodes of watery, tea-colored loose stools for the past eight months. He often has to get up in the middle of the night and states that fasting does not improve his symptoms. There is no history of blood in stools. However, he has lost about 16 pounds (7.3 kg) in weight during the same period. He has a history of diabetes mellitus, for which he uses subcutaneous insulin. He also has a history of cholecystectomy ten years back, for symptomatic cholelithiasis. His examination reveals a blood pressure of 100/50 mmHg, a pulse of 105 beats per minute, a respiratory rate of 12 per minute, and a temperature of 98 F. His systemic examination is unremarkable. His investigations reveal a WBC count of 6,000 per microL, a hemoglobin of 11gm/dl, a platelet count 250,000 per microL, serum ALT 35 IU/L, serum AST 30 IU/L, serum creatinine 0.8 mg /dl, serum sodium 135 meq/l , serum potassium 2.8 meq/l , serum chloride 110 meq/l, serum bicarbonate 18 meq/l, arterial pH 7.2, HbA1c 7.1% , blood sugar random 150 mg/dl and serum CRP 3.5 mg/l. His stool examination is negative for ova and cysts, and stool culture is negative. The stool osmolar gap is calculated to be 40 mOsm/kg. A colonoscopy with biopsy is normal. A contrast-enhanced CT scan reveals the presence of a 3 cm solitary mass in the tail of the pancreas. Urinary 5 hydroxytryptamine level is normal. The patient is treated with fluid and electrolyte supplementation. Which of the following is an appropriate treatment option in this patient?

## Choices:

1. Rifaxamine
2. Clonidine
3. Octreotide
4. Cholestyramine

## Answer: 3 - Octreotide

## Explanations:

- This patient has presented with chronic, voluminous diarrhea which does not resolve on fasting. The laboratory findings of hypokalemia, hyperchloremia, and normal anion gap acidosis along with normal stool osmolar gap make the diagnosis of secretory diarrhea. The presence of a solitary pancreatic lesion indicates the presence of pancreatic VIPoma. Somatostatin analogs are useful for the management of VIPoma.
- VIPomas are functional neuroendocrine tumors that secrete vasoactive intestinal peptide. The signs and symptoms are due to hormonal activation. Somatostatin analogs such as octreotide and lanreotide are highly effective in controlling diarrhea in VIPoma.
- The initial dose of octreotide is 50-100 mcg subcutaneously every 8 hours, followed by titration as required. Monthy depot intramuscular formulations are available once symptom control is adequate.
- Octreotide is usually well tolerated but can have some important side effects such as gall bladder hypomotility. Treatment with glucocorticoids can be considered in individuals with resistant diarrhea. Clonidine is useful in diarrhea associated with diabetic autonomic enteropathy, which is unlikely given the good glycemic control. Diarrhea can be present post-cholecystectomy due to malabsorption of bile salts; it is mainly osmotic and responds to cholestyramine. Small bowel overgrowth can be managed with oral antibiotics such as rifaxamine.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### ViPoma

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## Question 424:

A 57-year-old woman had a total thyroidectomy and was discharged with advice to take 500 mg of calcium carbonate twice a day. One week after surgery she complains of tingling around the mouth and new onset of muscle spasm. Her blood sample has been sent for electrolytes and albumin levels. While waiting for the blood test results, what is the most specific clinical test that could be performed to support the diagnosis?

## Choices:

1. Palpate the neck for a new swelling
2. Trousseau sign
3. Chvostek sign
4. Plantar response

## Answer: 2 - Trousseau sign

## Explanations:

- This patient has post-thyroidectomy hypocalcemia. Trousseau sign is most specific of all to support this diagnosis.
- Hypoparathyroidism is a potential complication following thyroidectomy or any other head and neck surgery. It may be transient or permanent.
- The Trousseau sign is elicited by inflation of a blood pressure cuff above (not less than) the systolic blood pressure for a maximum of 3 minutes. The sign is positive when a patient develops the adduction of the thumb and flexion of the metacarpophalangeal joints.
- A positive Chvostek sign is also suggestive of hypocalcemia but it is less specific than Trousseau sign, as a small percentage of the normocalcemic population will have a positive Chvostek sign.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hypoparathyroidism

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## Question 425:

A 45-year-old man comes for a follow-up evaluation. His pulmonary function test results show FEV1 is 76% of predicted, FVC is 72% of predicted, elevated FEV1/FVC, with normal DLCO. He was initially referred for persistent daytime sleepiness despite good sleep hygiene, with consistent nine hours of sleep a night. He has recently developed leg cramps after walking. He has a 30-pack-year smoking history. Vital signs are stable. Physical exam reveals a neck circumference of >38 cm. His peripheral pulses of lower extremities are decreased. What is the most likely etiology of persistent sleepiness?

## Choices:

1. Restless leg syndrome
2. Interstitial lung disease
3. Smoking
4. Obesity

## Answer: 4 - Obesity

## Explanations:

- The patient’s mildly reduced pulmonary function tests indicate a restrictive disease, such as obesity. Obesity causes a physical and mechanical compression of the chest cavity and diaphragm.
- Respiratory muscles have an increased work of breathing with increased airway resistance. The extra-abdominal adipose tissues decrease diaphragmatic movement, leading to quicker, shallower breaths in order to maintain oxygenation and perfusion.
- Obesity also contributes heavily to obstructive sleep apnea, which presents with daytime sleepiness despite an adequate number of hours slept at night.
- A neck circumference > 35.5 cm in men and >32 cm in women indicates obesity. Smoking does not cause daytime sleepiness. Restless leg syndrome may cause daytime sleepiness, but the patient usually gives a history of unusual leg sensation while sleeping.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Obesity

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## Question 426:

A 65-year-old HIV positive male is admitted to the intensive care unit (ICU) with septic shock secondary to lobar pneumonia. He is mechanically ventilated. After two days of intravenous ceftriaxone, trimethoprim-sulfamethoxazole, and erythromycin, his fever has resolved. Blood cultures are positive for Streptococcus pneumoniae. Despite adequate fluids and two micrograms/kg/min of norepinephrine, his oxygen saturation is 92% on room air, and blood pressure is 80/40 mmHg. Further examination reveals warm skin and full peripheral pulses. What is the best next step in the management of this patient?

## Choices:

1. Order a computed tomography scan of the nasal sinuses
2. Administration of intravenous corticosteroids
3. Intravenous dopamine
4. Check the sensitivity of the bacteria to antibiotics

## Answer: 2 - Administration of intravenous corticosteroids

## Explanations:

- Always consider adrenal insufficiency in the differential diagnosis of distributive shock, mainly when no other cause is present, or an original cause appears to be under effective treatment, as in this patient. Intravenous steroids will help raise the diminished glucocorticoid level.
- The adrenocorticotropic hormone (ACTH) test or the cosyntropin stimulation test can be performed to determine if the cause is central or peripheral. Patients with secondary adrenal insufficiency are more likely to have hypoglycemia but will not have dehydration, hyperkalemia, or skin hyperpigmentation. Consider testing for HIV and tuberculosis in patients with unclear etiology.
- Hyponatremia with hyperkalemia and hypoglycemia may be present. Serum cortisol, adrenocorticotropic hormone (ACTH), renin, aldosterone, and chemistry panel should be obtained early. Serum cortisol levels can help make a diagnosis in the presence of elevated ACTH and plasma renin activity.
- Refractory hypotension suggests adrenal insufficiency, especially with concomitant HIV infection in the face of effective treatment of sepsis. Searching for a second source of infection would be appropriate in an HIV-infected patient.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Adrenal Insufficiency

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 427:

A 23-year-old patient presents to the clinic with a 6-month history of missed periods, frequent headaches, and recent white, milky discharge from her nipples. She has also noticed vision problems during the past month. She has no significant medical history and takes no medications. Her blood pressure is 122/80 mmHg, pulse 88/min, respirations 16/min, and temperature 98.0 F (36.7 C). On examination, the patient has galactorrhea, decreased axillary and pubic hair, and bitemporal hemianopsia. Laboratory results show thyroid-stimulating hormone 3.4 IU/mL (0.27-4.20) and prolactin 175 ng/mL (3.4-24.1). Which of the following is the most appropriate next step in the management of this patient?

## Choices:

1. Start the patient on bromocriptine
2. MRI of the brain
3. Repeat laboratories in 1 month
4. Perform a beta-hCG

## Answer: 4 - Perform a beta-hCG

## Explanations:

- The patient's symptoms are consistent with a prolactinoma. Prolactin-secreting tumors of the pituitary gland are called prolactinomas. It is the most common secretory tumor of the pituitary gland accounting for up to 40% of total pituitary adenomas. Prolactinomas cause a wide variety of symptoms either due to the mass effect of the tumor or due to hypersecretion of prolactin. However, a pregnancy must be ruled out first before the diagnosis can be made.
- The differential diagnosis for hyperprolactinemia includes pregnancy, nipple stimulation in lactating women, and stress.
- The test begins with a serum prolactin level. If the prolactin level is high, comprehensive metabolic panel, TSH, and a pregnancy test (for women of childbearing age) should be obtained. Assessment of other pituitary hormones, including cortisol, ACTH, IGF-1, LH, FSH, and testosterone/estradiol should be done based on age and gender to exclude any hypopituitarism or other co-secreting tumors.
- Before further testing, including an MRI or CT, as well as pharmacological treatment with a dopamine agonist, can be considered, a beta-hCG must be performed.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Prolactinoma

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## Question 428:

A 65-year-old male patient presents to the hospital with a complaint of a mild backache that started two hours ago and is getting worse with time. The pain started after he sustained a fall earlier in the day. He further reveals that the pain is aggravated on any kind of movement of the spine. A detailed medical history reveals that he was diagnosed as a case of diabetes mellitus twenty years ago. His vital signs show blood pressure 110/70 mmHg, heart rate 78/min, and respiratory rate 14/min. An examination performed reveals tenderness in the upper lumbar spine. An x-ray performed reveals deformed spinal bone shape. Which of the following value is most likely to be present his condition?

## Choices:

1. Z-score above –2.0 standard deviation
2. T-score of –1 to –2.5 standard deviation
3. T-score of less than –2.5 standard deviation
4. Z-score of –2.0 standard deviation or lower

## Answer: 3 - T-score of less than –2.5 standard deviation

## Explanations:

- Osteoporosis is characterized by decreased bone strength due to reduced bone mineral density resulting in an increased risk of fracture. Secondary osteoporosis normally occurs due to a systemic disease that affects the bones.
- This patient most likely has a vertebral compression fracture. Osteoporosis is indicated by a T-score of less than –2.5 standard deviation (SD), and severe osteoporosis leads to fragile bones.
- A normal T-score value is within 1 standard deviation (SD) of the mean bone mineral density value. Diabetes mellitus can cause secondary osteoporosis by increasing osteoclast function and decreasing osteoblast function.
- Z-score is used in premenopausal women, men younger than 50 years, and children.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Secondary Osteoporosis

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## Question 429: What is the maximum reduction potential of hemoglobin A1c from treatment with thiazolidinediones?

## Choices:

1. 2.5%
2. 1.0%
3. 1.5%
4. 2%

## Answer: 4 - 2%

## Explanations:

- Hemoglobin A1c falls 2% at most with thiazolidinedione treatment alone. The range is 0.5% to 2.0%
- Thiazolidinediones are approved to treat diabetes mellitus type 2.
- Bind to PPAR-gamma nuclear receptor which forms a heterodimer with retinoid X receptor.
- They reduce insulin resistance.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Thiazolidinediones

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## Question 430:

A 7-year-old girl is brought to the clinic by her mother with concerns her daughter is “developing early.” She has had progressive breast enlargement over the past 8 months and is now taller than most of her peers. About 2 months ago, she developed vaginal bleeding, which lasted 7 days with a moderate flow. She denies a history of headaches or visual changes. Her mother attained menarche at the age of 11 years. She is not on any medications or supplements, and her past medical history is insignificant. She does well at school. There is no reason to suspect abuse. Physical exam reveals a well looking shy girl. Her temperature is 37.0 C, pulse 90/min, blood pressure 95/55 mmHg, and respiratory rate 18/min. Weight and height are on the 40th and 85th centiles, respectively. The general exam is significant for irregularly shaped light brown macules over the right lower back and right gluteal region. Breasts are tanner stage IV. Pubic and axillary hair is absent. The genital exam reveals moist pink vaginal mucosa, elongated labia minora with no signs of trauma. The rest of the exam is unremarkable. Lab investigations reveal baseline serum luteinizing hormone 0.1 IU/L. Bone age is advanced by more than 2 years. The skeletal survey reveals multiple bony deformities. What is the most likely diagnosis?

## Choices:

1. Central precocious puberty
2. Premature thelarche
3. Non-classical congenital adrenal hyperplasia
4. McCune Albright syndrome

## Answer: 4 - McCune Albright syndrome

## Explanations:

- This patient has progressive breast development, advanced bone age, menstrual bleeding, and suppressed LH levels before the age of 8 years. These features suggest a diagnosis of isosexual precocious pseudopuberty.
- The combination of peripheral precocious puberty, cafe au lait spots, and bony deformities (polyostotic fibrous dysplasia) is highly suggestive of McCune Albright syndrome.
- McCune Albright syndrome is caused by a post-zygotic activating mutation in the gene coding for the G protein subunit of Gs alpha. This results in unregulated activation of the cyclic adenosine monophosphate (cAMP) signaling pathway.
- McCune Albright syndrome is characterized by the development of recurrent ovarian follicular cysts, which leads to estrogen overproduction. This manifests as early breast development, growth spurt, and maturation of the external genitalia. Regression of ovarian cysts presents as menstrual bleeding. At times, menstrual bleeding may precede breast enlargement. Other complications of this condition include endocrinopathies (Cushing disease, acromegaly, hyperthyroidism) and hypophosphatemic rickets.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Precocious Pseudopuberty

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 431: A 27-year-old female competitive figure skater presents to the clinic with a 1-year history of inability to conceive. She states that she trains for two hours per day and maintains a strict diet. She notes that her menstrual cycles are irregular, and her last menstrual cycle was six months ago. Her blood pressure is 90/60 mmHg, pulse 60/min, respirations 15/min and temperature 98.0 F (36.7 C). Her BMI is 16.5 kg/m2. A urine hCG is negative. What is she at risk of developing?

## Choices:

1. Recurrent abortions
2. Stress fracture of the second metatarsal
3. Pancreatic insufficiency
4. Dental caries

## Answer: 2 - Stress fracture of the second metatarsal

## Explanations:

- The first step in the evaluation of any patient with secondary amenorrhea is a urine pregnancy test.
- Secondary amenorrhea occurs when a patient who has passed menarche goes six months or longer without menses.
- There are three general causes of secondary amenorrhea: hormonal disturbance leading to a lack of a normal menstrual cycle, physical damage to the endometrium, which prevents its growth, or obstruction of the outflow path of the menstrual blood.
- The female athlete triad consists of disordered eating, low bone mineral density, and amenorrhea. Female competitive athletes, particularly in activities such as dancing, cheerleading, or figure skating, are susceptible to disordered eating. Insufficient caloric intake is associated with low bone mineral density and an increased risk for stress fractures.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Secondary Amenorrhea

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 432:

A 62-year-old woman presents to the clinic for a dry cough and feeling short of breath. She has a history of hypertension, gastroesophageal reflux disease, and kidney stones. She complains of hoarseness while talking loud for an extended period of time and singing. Her weight is stable and she denies palpitations. Physical examination shows a minimally overweight woman (BMI 25.3 kg/m2) with normal heart, abdominal, and locomotor system examination. The thyroid gland is bilaterally enlarged. Chest auscultation shows a high-pitched sound during inspiration. Thyroid function tests show free T4 1.3 ng/dL, (reference 0.8-1.8 ng/dL), free T3 3.2 pg/dL (reference 2.8-4.4 pg/dL) and TSH 0.52 IU/L (reference 0.27-4.20 IU/L). Pulmonary function tests show impairment of inspiratory function. CT of the chest shows left thyroid extends 2.4 cm and right thyroid extends 5.7 cm below the thoracic inlet reaching the mid-level of the aortic arch. The intrathoracic portion of the right thyroid tissue contains a 2.3 cm round isodense thyroid nodule. Which of the following is the next best step in the management of this patient?

## Choices:

1. Fine needle aspiration
2. Observation and routine follow up
3. Thyroid uptake scan
4. Thyroidectomy

## Answer: 4 - Thyroidectomy

## Explanations:

- The patient must be operated because she has stridor, a positive Pemberton sign, an abnormal pulmonary function test result, and her thyroid reaches to the aortic arch.
- Extracervical approach, like sternotomy or thoracotomy, is needed only in 1 to 7.6% of patients undergoing substernal goiter surgery.
- One of the indications for an extra-cervical approach is extension of the thyroid to the aortic arch. Thoracic surgery consult is required for this patient who has a substernal goiter extending to the middle of the aortic arch.
- Ultrasound-guided thyroid fine-needle aspiration is not recommended for substernal goiter as it may cause bleeding and sudden enlargement of the intrathoracic component of goiter. Recent studies show that thyroid cancer rate in substernal goiter is not different than cervical goiter.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Substernal Goiter

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 433:

A 32-year-old female complains of fatigue that started five months ago. She is getting exhausted at work and has trouble concentrating, and she is afraid she may lose her job. She has a past medical history of bipolar disorder, hypertension, and autoimmune pancreatitis. She is taking lithium and hydrochlorothiazide. She has a history of multiple hospitalizations due to depressive and manic episodes. Her last hospitalization was one year ago. She tried quetiapine and lamotrigine in the past but said that lithium had been the only medication that helped her. Mental status examination and physical examination are unremarkable. She has no suicidal ideation. Blood tests show a lithium level of 0.8 mmol/L (range: 0.6-1.2), hemoglobin of 12 g/dL, mean corpuscular volume: 93 fL, white blood cells: 8,0000/mm3, sodium: 140 mEq/L, potassium: 4.4 mEq/L, bicarbonate: 25 mEq/L, creatinine: 0.9 mg/dL, calcium: 8.2 mg/dL, thyroid-stimulating hormone (TSH): 13 microU/mL, and free T4: 0.5 ng/dL. What is the next best step in the management of this patient?

## Choices:

1. Continue lithium and give levothyroxine
2. Decrease dose of lithium and add another mood stabilizer and levothyroxine
3. Discontinue lithium and give another mood stabilizer and levothyroxine
4. Decrease the dose of lithium and add levothyroxine

## Answer: 1 - Continue lithium and give levothyroxine

## Explanations:

- This patient with fatigue, elevated TSH, and low T4 levels in the setting of lithium therapy likely developed lithium-induced hypothyroidism.
- Lithium interferes with the synthesis and release of thyroid hormone that can lead to hypothyroidism and typically occurs in the first two years of treatment.
- Physical examination for goiter and thyroid function tests should be evaluated before initiating patients on lithium and every 6-12 months after starting lithium.
- The development of lithium-induced hypothyroidism is not an indication to discontinue lithium. Patients may continue to take lithium, especially if they have a history of severe mood episodes that respond preferentially to lithium. Treatment with levothyroxine is appropriate in this patient.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Lithium Toxicity

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## Question 434:

A 55-year-old man presents to the clinic for a follow-up of type 2 diabetes mellitus. He has been taking metformin for the last 8 months. Upon review of his records, his postprandial glucose levels are found to be extremely high; the fasting plasma glucose levels are within the normal range. He decides to start him on a drug that would competitively inhibit digestive enzymes in the brush border of the small intestine. In addition to normalizing postprandial glucose levels, this drug will also potentially reduce the risk of macro- and microvascular complications related to type 2 diabetes mellitus. Which of the following is a rare side effect associated with the use of this drug that has not been reported with the other drugs of this class?

## Choices:

1. Flatulence
2. Diarrhea
3. Abdominal pain
4. Hepatitis

## Answer: 4 - Hepatitis

## Explanations:

- Alpha-glucosidase inhibitors are a group of antidiabetic drugs that competitively inhibit enzymes that digest carbohydrates in the brush border of the small intestine.
- Among the alpha-glucosidase inhibitors, acarbose is the most popular and widely studied drug. In addition to being particularly useful for controlling excessive postprandial glucose, it also reduces the risk of micro- and macrovascular complications associated with type 2 diabetes mellitus.
- Hepatitis is a rare adverse effect reported with the use of acarbose; it is reversible once the drug is stopped.
- Liver function tests (LFTs) should be monitored before and during treatment with acarbose due to the risk of developing hepatitis. Flatulence, diarrhea, and abdominal pain are the adverse effects of all alpha-glucosidase inhibitors, not just acarbose.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Alpha Glucosidase Inhibitors

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## Question 435: A patient with small cell carcinoma presents to you with fatigue. On exam, the patient has a buffalo hump, moon facies, striae, and hypertension. What is the most common electrolyte abnormality seen in these patients?

## Choices:

1. Hyperkalemia
2. Metabolic acidosis with hyponatremia
3. Hypokalemia with metabolic alkalosis
4. Respiratory acidosis with compensated metabolic alkalosis

## Answer: 3 - Hypokalemia with metabolic alkalosis

## Explanations:

- Remember, patients with malignancy present with various types of syndromes, such as antidiuretic hormone secretion and hypercalcemia.
- One should always be aware of paraneoplastic syndromes and how to treat them.
- Ectopic ACTH syndrome is a feature of some lung cancers, including carcinoids and small cell tumors.
- It is important to recognize ectopic ACTH secretion as it carries a high morbidity. Most patients will present with hypertension and severe hypokalemic metabolic alkalosis.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Cushing Syndrome

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## Question 436:

A 39-year-old woman presents to the office complaining of weight gain. She has no significant medical history and contributes her weight gain to a sedentary lifestyle due to being laid off from her job as a school teacher. Vital signs are stable, and body mass index (BMI) is 33 kg/m2. The patient denies depressed mood or menstrual changes. Lab work shows normal thyroid-stimulating hormone levels and normal blood counts. To lose one pound (0.45 kg) per week, this patient should limit her daily caloric intake to which of the following?

## Choices:

1. 1000 kcal
2. 1500 kcal
3. 2000 kcal
4. 2500 kcal

## Answer: 2 - 1500 kcal

## Explanations:

- Adult women and men differ in what they need in regards to caloric intake.
- Thus they have different requirements for weight loss.
- On average, a woman should eat 2000 kcal per day to maintain her weight, and she should limit her caloric intake to 1500 kcal or less in order to lose one pound (0.45 kg) per week.
- For the average male to maintain his body weight, he should eat 2500 kcal per day, or 2000 kcal a day if he wants to lose one pound (0.45 kg) per week.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Calories

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## Question 437:

A 40-year-old woman presents to the clinic with a weight loss of 30 lbs over the last two months. Her past medical history is significant for diabetes mellitus, hyperlipidemia, and obesity. She has a 10 pack-year history of smoking and quit recently. Vital signs show a heart rate of 100/min, blood pressure of 160/92 mmHg, a temperature of 98.4 F, and respiratory rate of 17/min. Physical examination reveals bilateral proptosis, moderate thyromegaly with a bruit, and bilateral hand tremors. Laboratory assessment shows a suppressed TSH of 0.01 microU/L (reference range: 0.35-5.5 microU/mL) and an elevated free T4 of 72 mcg/dL (reference range: 4-12.3 mcg/dL). CT scan of the neck with contrast shows an enlarged thyroid with multiple nodules with the largest one being 2 cm in size. A radioiodine uptake scan shows low uptake of less than 10%. Which of the following is the next best step in the management of this patient?

## Choices:

1. Prednisone
2. Thyrotropin receptor antibodies test
3. Radioiodine ablation therapy
4. Thyroidectomy

## Answer: 2 - Thyrotropin receptor antibodies test

## Explanations:

- Graves disease is characterized by hyperthyroidism, proptosis, and pretibial myxedema. It is an autoimmune disorder with the production of thyrotropin receptor antibodies.
- Graves disease is diagnosed by high levels of thyrotropin antibodies and thyroid-stimulating immunoglobulin.
- Graves disease is characterized by increased diffuse uptake on the radioiodine uptake and scan. However, a recent CT with contrast could saturate the thyroid with iodine and therefore result in a low uptake on the radioiodine uptake and scan.
- Graves disease is treated with antithyroid medications (methimazole, propylthiouracil), radioiodine ablation, or thyroidectomy.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Nuclear Medicine Endocrine Assessment, Protocols, And Interpretation

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## Question 438: A male is being investigated for infertility. He undergoes a post-coital test, where sperm is evaluated on its interaction within cervical mucus, which reveals 15 sperm in the high power field under a microscope. What is the next step in his investigation?

## Choices:

1. Check for anti-sperm antibodies
2. Assess sperm function
3. Rule out the common sexually transmitted disorders
4. Check the couples coital technique

## Answer: 2 - Assess sperm function

## Explanations:

- An abnormal post-coital test result is noted in about 10% to 15% of infertile couples.
- A post-coital test is indicated when the semen viscosity is high, for unexplained infertility, or if there is a decrease or increase in semen volume, despite having normal sperm density.
- The post-coital test is performed at mid-cycle during the follicular phase of the menstrual cycle. The cervical mucus is examined to look for the absence or presence of sperm.
- In normal cases, there should be 10 to 20 sperm visible in the high-power field of view. If the test is normal, then one should look for the function of sperm as the next step. If no sperm are seen, then the couple's coital technique should be assessed.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Semen Analysis

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## Question 439:

A 32-year-old female comes to the outpatient clinic complaining of sore throat, oral ulcer, and fever for the last four days. Her past medical history includes weight loss, diarrhea, sweating, and palpitation, for which she was referred to an endocrinologist. After a detailed evaluation, she was started on antithyroid medication from the past two weeks. Her vital signs are blood pressure:140/90 mmHg, pulse rate: 90 beats per minute, respiratory rate: 19/min, and temperature 36.4 C. She is a non-smoker but drinks 2-3 glasses of wine on weekends. She is in a monogamous relationship with her husband and has two kids. Her mother died from breast cancer five years ago. Which of the following is the next best step in the management of this patient?

## Choices:

1. Start her on broad-spectrum antibiotics
2. Stop her antithyroid medication and check her complete blood count (CBC) with differential count
3. Test for HIV infection
4. Symptomatic treatment and send her home

## Answer: 2 - Stop her antithyroid medication and check her complete blood count (CBC) with differential count

## Explanations:

- The patient likely has agranulocytosis or neutropenia due to the recent use of antithyroid medication.
- For a patient with suspected agranulocytosis, the next best step is to stop the offending agent and check the complete blood count with the differential count.
- Although rare, antithyroid medication like carbimazole causes agranulocytosis or neutropenia.
- A patient suspected of having bacterial infection can be started on broad-spectrum antibiotics once the blood count confirms agranulocytosis.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Agranulocytosis

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## Question 440:

A 62-year-old male presents for a regular health check-up. The patient has a past medical history of hypertension, congestive heart failure, chronic kidney disease, and type 2 diabetes mellitus. The patient does not drink alcohol, smoke cigarettes, or use illicit drugs. The patient's recent hemoglobin A1c (HbA1c) reported 8.7% despite taking the maximum dosage of his metformin. He was previously taking sitagliptin but was discontinued due to adverse effects. The clinician is considering starting the patient on a medication for his uncontrolled glucose that also has beneficial effects on his cardiovascular and renal disease. What test should be done prior to administering this agent?

## Choices:

1. Liver function
2. Kidney function
3. Thyroid function
4. Electrocardiogram

## Answer: 2 - Kidney function

## Explanations:

- This patient is considering starting the patient on dapagliflozin, an SGLT-2 inhibitor. Dapagliflozin is indicated in type 2 DM patients to improve blood glucose control and minimize the hospitalization attributed to heart failure in type 2 DM patients.
- Dapaglifozin is also indicated to minimize the risk of the continued decline of estimated glomerular filtration rate (eGFR), ESRD, CV mortality, and hospitalization for heart failure in chronic kidney disease (CKD) patients at risk of progressive disease. This patient has a history of congestive heart failure, type 2 DM, and chronic kidney disease.
- This patient has chronic kidney disease, and the renal function should be assessed prior to initiating dapagliflozin (answer 2). Initiating therapy in subjects with eGFR less than 25 is not advised, but therapy may be continued to decrease the risk of declining eGFR, ESRD, cardiovascular mortality, and hospitalization for heart failure.
- Assessing liver function is not the correct answer as empagliflozin and dapagliflozin may be used in subjects with hepatic impairment. SGLT-2 inhibitors do not interact with the thyroid. An electrocardiogram is incorrect as it does not need to be assessed prior to initiating dapagliflozin.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Sodium-Glucose Transport Protein 2 (SGLT2) Inhibitors

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## Question 441:

A 25-year-old woman presents to the clinic with severe left leg pain for the last 15 days. There is no antecedent history of trauma/fever. She reports a history of surgery for removal of right hip swelling that had developed chalky-white discharge 2 years ago. On examination, she has erythema over the left leg with severe diffuse tenderness. Her blood counts are normal. Erythrocyte sedimentation rate and C-reactive protein level are 30 mm/h and 10 mg/dL, respectively. Plain x-ray reveals periosteal reaction with thickening of the cortex in the left tibia. Which of the following is the next best step in the management of this patient?

## Choices:

1. IV piperacillin-tazobactam and limb support
2. Oral naproxen
3. Leg brace and immobilization
4. Surgical removal

## Answer: 2 - Oral naproxen

## Explanations:

- The leg pain represents hyperostosis in the left tibia, which is seen in patients with hyperphosphatemic tumoral calcinosis. The previous history of removal of hip swelling with chalky-white discharge suggests the diagnosis of tumoral calcinosis.
- Hyperostosis requires symptomatic management in the form of analgesic treatment. Tab naproxen for 5-7 days should take care of the pain in the left leg.
- Tibia is the most common site of hyperostosis, but other bone involvement, including radius, ulna, and metacarpals, has also been reported.
- Although the picture resembles osteomyelitis, the history suggestive of tumoral calcinosis makes hyperostosis the first differential diagnosis. There was no fracture line on the x-ray or calcific mass in soft tissues suggestive of myositis ossificans.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hyperphosphatemic Tumoral Calcinosis

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## Question 442:

A 37-year-old man presents to the hospital complaining of erectile dysfunction for a few weeks. He says that he has a constantly diminished sense of well-being. He has been married for three years, but he and his partner have not been able to conceive. His past medical history is significant for diabetes mellitus, and surgical history is suggestive of intracranial surgery. On examination, it is noticed that his testicular volume is reduced, and there is a paucity of pubic hair. MRI brain shows empty and enlarged sella turcica. What is the best treatment recommendation for him?

## Choices:

1. Progesterone injections
2. Neurosurgical consultation
3. Human chorionic gonadotropin injections
4. Testosterone injections

## Answer: 3 - Human chorionic gonadotropin injections

## Explanations:

- The decreased pituitary function can cause a deficiency in all hormones associated with the gland.
- Hypogonadism occurs when there is a deficiency of gonadotropins, and it presents with small and atrophied testes in men.
- In secondary hypogonadism, testosterone can be delivered by gel, patch, oral, or intramuscular (IM) injections with careful monitoring of prostate-specific antigen (PSA) and hemoglobin levels.
- If fertility is desired, then one starts with human chorionic gonadotropin (hCG) injections to augment testosterone levels and improve semen quality. If this is not successful after one year, the patient can consider human menopausal gonadotropin (HMG)/recombinant FSH concomitant therapy to enhance fertility further.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hypopituitarism

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## Question 443:

A 15-year-old girl is brought to the clinic with yellow eyes for one month. She also has exertional fatigue and dark urine. Her vital signs show heart rate 89/min, blood pressure 110/75mmHg, respiratory rate 20/min, oxygen saturation 97% on air, and temperature 37.0 C. Her hemoglobin is 10 g/dL, total serum bilirubin 2.5 mg/dL, indirect bilirubin 1.9 mg/dL and mean corpuscular volume 90 fL. Serum lactate dehydrogenase is 320 U/L. She has no pruritus or skin rash. She previously had similar symptoms during episodes of febrile illness. Which of the following tests is most likely to confirm the diagnosis in this patient?

## Choices:

1. Osmotic fragility test
2. Molecular analysis
3. Serum LDH assay
4. Enzyme activity levels

## Answer: 2 - Molecular analysis

## Explanations:

- Pyruvate kinase deficiency (PKD) causes hemolytic anemia. Molecular PK-LR testing confirms PKD.
- Initial evaluation with enzyme activity testing is useful. However, falsely normal enzyme levels may occur.
- Transfusion and reticulocytosis spuriously increase PK levels.
- Osmotic fragility and serum LDH testing are non-specific.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Pyruvate Kinase Deficiency

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## Question 444:

A 25-year-old female patient presented to the emergency department for sporadic heart palpitations with associated dyspnea on exertion. These episodes occur several times a week, lasting several minutes and resolving without any intervention. Her blood pressure is 143/100 mmHg, pulse rate is regular at 122 beats/min, and her body mass index (BMI) is 18 kg/m2. Her electrocardiography (EKG) shows sinus tachycardia. Her physical examination reveals a slight tremor when the arms are extended, and the skin is moist to touch. Her menstrual bleeding occurs every 34 days. Which of the following is the most appropriate management for her tachycardia?

## Choices:

1. Metoprolol
2. Diltiazem
3. Amiodarone
4. Digoxin

## Answer: 1 - Metoprolol

## Explanations:

- Beta-blocker therapy, such as propranolol, atenolol, and metoprolol, is useful to reduce adrenergic features such as sweating, anxiety, and tachycardia in hyperthyroidism.
- Propanolol is a nonselective beta-blocker that is preferred for hyperthyroidism due to its effects on lowering hypermetabolism; however, it is dosed multiple times a day.
- Metoprolol and atenolol are beta-1 selective beta-blockers, and maybe more convenient for patients for single daily dosing.
- Calcium channel blockers, such as diltiazem, may be considered for symptomatic rate control in patients who cannot tolerate beta-blockers. Amiodarone and digoxin are not indicated for the first-line treatment of sinus tachycardia secondary to hyperthyroidism. These medications may be considered if the patient has atrial fibrillation due to overt hyperthyroidism, and needed additional rhythm control to control the heart rate.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Thyrotoxicosis

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## Question 445:

A female patient with long-standing Rheumatoid arthritis is referred to the clinic for persistent hyperglycemia. She has been managed for over a decade by her rheumatologist with disease-modifying monoclonal antibodies, hydroxychloroquine, and glucocorticoids. She is currently taking 15 mg daily of prednisone daily for the last 6 months. Her most recent hemoglobin A1c is 7.9% while on her current metformin regimen. On clinical examination, she has elevated blood pressure, multiple ecchymoses, and moon facies with facial acne. She is discouraged because she feels her rheumatologic symptoms are barely controlled and she has been progressively gaining weight despite her best efforts at caloric restriction and portion size control. Which of the following is the least likely finding in this patient?

## Choices:

1. Persistently elevated serum ACTH levels
2. Finding of left side avascular necrosis of the hip
3. Finding of osteoporosis of the hips and spine on DEXA measurement.
4. Finding of fasting hyperglycemia and leukocytosis with neutrophilia.

## Answer: 1 - Persistently elevated serum ACTH levels

## Explanations:

- The patient's clinical presentation is suggestive and consistent with iatrogenic exogenous hypercortisolemia. Exogenous glucocorticoids suppress ACTH secretion from the anterior pituitary gland.
- Exogenous glucocorticoid exposure is associated with secondary suppression of endogenous pituitary ACTH production and therefore persistent elevation of serum ACTH is the least expected finding.
- The patient's clinical presentation is suggestive and consistent with iatrogenic exogenous hypercortisolemia. Patients with long-standing autoimmune disease often receive chronic exogenous glucocorticoids and thus will have suppressed ACTH levels.
- All the other alternative answers including osteoporosis, avascular necrosis of the hip, and fasting hyperglycemia with leukocytosis are all complications of chronic glucocorticoid exposure.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hypercortisolism

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## Question 446:

A 38-year-old woman presents to the clinic for evaluation. Her BMI is 38 $kg/m^2$, and she has a history of anxiety and depression. She has tried diet and exercise but has struggled to lose weight or keep it off. She has been deemed fit enough to undergo general anesthesia. Which of the following conditions, if present, would be strongest indication for bariatric surgery in this patient?

## Choices:

1. Type 2 diabetes mellitus
2. Hypothyroidism
3. Anemia
4. Hyperthyroidism

## Answer: 1 - Type 2 diabetes mellitus

## Explanations:

- Type 2 diabetes is a serious disease and has previously been felt to be insurable. It is associated with significant morbidity and increased mortality, with 50% of patients requiring treatment with insulin at 10 years following diagnosis.
- Although very low-calorie diets have been shown to lead to improvement or resolution of type 2 diabetes, the results are usually not sustained. Conversely, bariatric surgery leads to sustainable results.
- Meta-analyses have shown that 71.8% of patients achieved complete resolution of their type 2 diabetes following surgery, which is significantly better than the outcome achieved with medical treatment alone. In addition, there is an average weight loss of 55% following surgery.
- The National Institute for Health and Care Excellence (NICE) guidelines on obesity recommend that surgery should be provided for patients that meet all of the following criteria: - BMI of 40 or more, or a BMI between 35 and 40 and a serious condition that might improve if you lost weight (such as type 2 diabetes or high blood pressure). All other weight loss methods, such as dieting and exercise, have been tried without success. - The patient agrees to long-term follow-up after surgery – such as making healthy lifestyle changes and attending regular check-ups. - The patient is physiologically healthy enough to have surgery under general anesthesia.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Counseling Patients On Bariatric Surgery For Obesity

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## Question 447:

A 68-year-old man presents with a 2-week history of central blurred vision and seeing haloes around bright lights. He has a past medical history of borderline ocular hypertension, gout, type 2 diabetes mellitus, and Crohn's disease. He is started on betaxolol. Which of the patient's comorbidities is most likely to be negatively affected by this drug?

## Choices:

1. Gout
2. Crohn's disease
3. Hyperlipidemia
4. Diabetes

## Answer: 4 - Diabetes

## Explanations:

- Betaxolol and other beta-blockers should be used with caution in patients with diabetes mellitus. Beta-blockers may potentiate or mask the symptoms of hypoglycemia.
- Hyperglycemia and hypoglycemia are adverse reactions that could be expected in patients with diabetes mellitus taking betaxolol.
- The other metabolic side effect of beta-blockers is hyperkalemia.
- Betaxolol does not cause hyperurecemia.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Betaxolol

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## Question 448:

A 33-year-old male patient presents to his family doctor clinic with recurrent spells of weakness and fatigue for the last few days. Symptoms are worse in the mornings. He denies any slurred speech or any other neurological symptoms. Vitals are within normal limits. The neck exam shows diffuse goiter. The heart, abdomen, lung, and extremity exam is within normal limits. Neuro exam is negative for any acute weakness. Labs show normal complete blood count, normal electrolytes. A thyroid panel is significant for low TSH and elevated free t4. The patient gets a referral to an endocrinologist for possible thyrotoxic periodic paralysis and gets discharged from the clinic. He comes back four more times in the next two weeks with similar complaints. His potassium was found to be low with subsequent visits, and he gets a potassium replacement and gets discharged. What is the next best step to prevent his recurrent visits?

## Choices:

1. Prescribe oral potassium prophylactically to prevent hypokalemic episodes
2. Radioactive thyroid ablation
3. Refer him to a neurologist
4. Send him home with a 30-day event monitor

## Answer: 2 - Radioactive thyroid ablation

## Explanations:

- Radioactive ablation or surgery is the definitive treatment for Graves's disease. Restoration of euthyroid status is the definitive goal in these patients to prevent further attacks.
- Until euthyroid status is achieved, these kinds of patients need recurrent potassium replacement during acute attacks and also might need non-selective beta-blockers along with avoidance of other precipitating factors.
- Antithyroid drugs (Thionamides) are used in the treatment of hyperthyroid patients while they are waiting for definitive treatment with surgery or radioactive ablation. Carbimazole and Propylthiouracil are the most commonly used drugs.
- He does not have any major tachyarrhythmias causing his weakness, so an event monitor is not that helpful. Prophylactic use of potassium to prevent hypokalemic episodes is not helpful in thyrotoxic periodic paralysis. He does not have any other focal neurological signs that warrant a neurologist evaluation.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Thyrotoxic Periodic Paralysis

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## Question 449:

A 16-year-old male diagnosed with type 1 diabetes mellitus for 10 years was brought to the emergency department due to unrelenting vomiting for 12 hours. He was noncompliant with his insulin medications and did not follow up with his clinician for a year. His urine showed ketones. Arterial blood gas analysis was noted with metabolic acidosis and he was started on saline and insulin. Which statement supports the clinical scenario in this patient?

## Choices:

1. It occurs only in patients with type 1 diabetes mellitus.
2. It is more common in children and adolescents than adults.
3. It is most commonly caused by missed insulin doses.
4. The main cause of death is dehydration.

## Answer: 2 - It is more common in children and adolescents than adults.

## Explanations:

- Diabetic ketoacidosis (DKA) occurs primarily in patients with type 1 diabetes mellitus, but it can also occur in some patients with type 2 diabetes mellitus.
- It is most commonly due to an infection.
- Death from DKA is primarily caused by cerebral edema.
- When evaluating the acid-base status, it is important to include an electrolyte imbalance or anion gap in the synthesis of the information. For example: In a patient who presents with DKA, they will eliminate ketones, close the anion gap but have persistent metabolic acidosis due to hyperchloremia.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Pediatric Diabetic Ketoacidosis

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## Question 450:

A 30-year-old female presents to the clinic with complaints of generalized bone pain and muscle weakness of lower limbs. The symptoms started about six months ago and have become worse with time. A detailed medical history reveals that the patient has been diagnosed with atopic dermatitis three years ago for which she has been taking topical steroids. The dermatologist has placed her on a specialized diet (no dairy products and fish) and asked her to avoid ultraviolet exposure. A physical examination was carried out which reveals generalized bone tenderness as well as proximal muscle weakness. Which of the following lab values are most likely to be found in this patient?

## Choices:

1. Decreased calcium, increased phosphate, increased alkaline phosphate, decreased parathyroid hormone
2. Increased calcium, decreased phosphate, increased alkaline phosphate, increased parathyroid hormone
3. Decreased calcium, decreased phosphate, increased alkaline phosphate, increased parathyroid hormone
4. Decreased calcium, decreased phosphate, normal alkaline phosphate, increased parathyroid hormone

## Answer: 3 - Decreased calcium, decreased phosphate, increased alkaline phosphate, increased parathyroid hormone

## Explanations:

- Osteomalacia can present with bone pain and muscle weakness. This occurs due to low vitamin D in adults. In the scenario, dietary restrictions and reduced sun exposure contribute to the deficiency in the patient.
- Decreased vitamin D can lead to decreased reabsorption of calcium and phosphate leading to hypocalcemia and hypophosphatemia.
- Around 80% of people diagnosed with osteomalacia have an elevated serum alkaline phosphatase due to bone resorption. Serum parathyroid hormone levels are also typically elevated.
- Treatment is the administration of active vitamin D and calcium orally.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Osteomalacia

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## Question 451: A 16-year-old presents with fatigue, acne, weight gain, and amenorrhea. She has gained 25 (11 kg) pounds over the past 6 months. She has been amenorrheic for 4 months and multiple pregnancy tests have been negative. She has striae at both flanks, a moon face, and a buffalo hump. What is the most common cause of this condition?

## Choices:

1. Adrenocortical adenoma
2. Exogenous corticosteroids
3. Pituitary microadenoma
4. Ectopic adrenocorticotropic hormone (ACTH) secretion

## Answer: 2 - Exogenous corticosteroids

## Explanations:

- The most common cause of Cushing syndrome is the exogenous administration of corticosteroids.
- Cushing disease is most commonly due to a pituitary microadenoma.
- In rare cases, adrenal tumors may produce excess cortisol and cause Cushing syndrome.
- Ectopic adrenocorticotropic hormone (ACTH) secretion also can cause Cushing syndrome. The most common tumors that produce ectopic ACTH are lung and renal cancers.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Cushing Syndrome

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## Question 452:

A 45-year-old man with a history of diabetes, methamphetamine use disorder, and alcoholism presents to the emergency department for evaluation of shortness of breath and increasing lower extremity edema. His vital signs show temperature 98.6 F, heart rate 75/min, respiratory rate 18/min, oxygen saturation 92% on room air, and blood pressure 95/65 mmHg. His physical exam is notable for dry mucus membranes, scleral icterus, an S4 gallop, bibasilar lung crackles, a distended abdomen, and bilateral +2 pitting edema of his lower extremities. His labs return significant for creatinine 2.2 mg/dL, AST 220 IU/L, ALT 110 IU/L, albumin 2.5 mg/dL, and HbA1c 12%. Urinalysis reveals 4+ protein and >1000 mg/dL glucose. The patient is admitted to the hospital for further evaluation. Further renal workup with a 24-hour urine collection reveals 5 g of protein. An echocardiogram is also ordered that returns with an ejection fraction of 35% with mild diastolic dysfunction. A plasma volume study is performed, which indicates the patient is hypovolemic, so he is given a 1L normal saline bolus. Which of the following is the strongest indication for a plasma volume study in this patient?

## Choices:

1. Hypotension
2. Type 2 diabetes
3. Methamphetamine use disorder
4. Cirrhosis

## Answer: 4 - Cirrhosis

## Explanations:

- Plasma volume studies help in the determination of a patient's volume status.
- Clinically, it can be difficult to determine volume status in patients with congestive heart failure, nephrotic syndrome, and cirrhosis.
- When albumin is low, there is a loss of oncotic pressure, which results in a loss of intravascular fluid into the extravascular space. This leads to a clinical picture of volume overload, but in actuality, the patient is intravascularly depleted.
- Volume status can also be difficult to determine in the setting of a patient with multiple of these conditions, which makes a volume study more beneficial.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Plasma Volume Study

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## Question 453:

A 36-year-old woman presents to the office for persistent discharge of milky fluid from both breasts. She also reports the enlargement of her breast tissue on both sides. She reports that she is not pregnant as she has not been sexually active in the last seven years. She has adequate vision, and visual fields are intact to confrontation. Pupillary light reflexes and extraocular eye movements are intact. Her breast exam shows bilateral breast enlargement with the expression of a milky discharge. Her prolactin level is 145 ng/mL, and MRI does not show any brain mass. A pregnancy test is negative. Dysfunction of which of the following nuclei is most likely responsible for this patient's condition

## Choices:

1. Supraoptic nucleus
2. Mammillary body
3. Arcuate nucleus
4. Ventromedial nucleus

## Answer: 3 - Arcuate nucleus

## Explanations:

- Arcuate nucleus releases growth hormone-releasing hormone (GHRH) and also produces prolactin-inhibiting hormone (dopamine).
- The tuberoinfundibular pathway contains dopaminergic neurons that originate from the arcuate nucleus. These neurons transport dopamine, which creates an antagonistic effect against prolactin, which is released from the anterior pituitary gland.
- Pregnancy is the most common cause of galactorrhea, but in non-pregnant patients, a pituitary tumor has to be excluded. If no tumor is identified, hypothalamic dysfunction is suspected.
- The ventromedial nucleus is the center of satiety or fullness. The mammillary nucleus is part of the limbic system, a system that is responsible for memory, behavior, motivation, and motivation. The supraoptic nucleus main function is the production and secretion of vasopressin.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hypothalamic Dysfunction

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## Question 454:

A 48-year-old woman is brought to the clinic with symptoms of recurrent fatigue, blurred vision, sweating, and tremors especially if the meal is delayed. At her office, a colleague checked her blood glucose from his own glucometer during one of these episodes and noted a blood glucose reading of 50 mg/dL. The patient's past medical history includes hypothyroidism, for which she takes levothyroxine 125 mcg per day. Recently, the patient was prescribed amitriptyline for anxiety. She does not smoke and drinks about 10 units of alcohol per week. Family history includes breast cancer and type 2 diabetes. Physical examination is unremarkable. The patient is admitted for a 72-hour fast. She develops symptoms at 36 hours. A set of investigations during the episode is shown below.

| | Patient value | Reference range |
|---|---|---|
| Serum glucose | 35 mg/dL | 65-100 mg/dL |
| Serum insulin | 28 microIU/mL | 1.4-14 microIU/mL |
| Serum C-peptide | 9 ng/mL | 0.9-4.3 ng/dL |
| Insulin antibodies | Negative | Negative |
| Sulfonylurea screen | Negative | Negative |

Which of the following is the most likely cause of the patient's hypoglycemia?

## Choices:

1. Drug-induced hypoglycemia
2. Excess endogenous insulin production
3. Self-administration of insulin
4. Alcohol-induced hypoglycemia

## Answer: 2 - Excess endogenous insulin production

## Explanations:

- The results are suggestive of hyperinsulinemic hypoglycemia. Elevated insulin and C-peptide in the context of low serum glucose is suggestive of endogenous insulin excess.
- This patient is not taking any medication that can cause hypoglycemia.
- If the patient were self-administering insulin, then Insulin and C-peptide levels would be low.
- The patient does not report a history of alcohol excess. Furthermore, insulin levels are not high in alcohol-induced hypoglycemia. Therefore, this cause can be ruled out based on the investigations.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Non-diabetic Hypoglycemia

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## Question 455:

A 36-year-old male presents with tiredness, weight loss, polyuria, polydipsia, and polyphagia for the past two months. He does not use tobacco, alcohol, or drugs. He has a strong family history of type 1 diabetes and thyroid disease. On physical examination, his BMI is 25 kg/m2, and blood pressure 120/80 mm/Hg. His laboratory evaluation reveals fasting plasma glucose 270 mg/dl, HbA1C 8.5 percent, normal liver, renal function tests, and negative serum and urine ketones. His serum is negative for islet-cell antibody (ICA), tyrosine phosphatase antibody (IA 2A), glutamic acid decarboxylase antibody (GADA), and zinc transporter antibody 8 (ZnT8). He has T lymphocytes reactive to islet-cell antigens. What treatment plan is anticipated in this patient?

## Choices:

1. He will not require insulin therapy for at least six months after diagnosis
2. He will require insulin therapy in the first three months after diagnosis
3. He will require intravenous insulin infusion for ketoacidosis shortly after diagnosis
4. He can be managed with a sulfonylurea alone

## Answer: 1 - He will not require insulin therapy for at least six months after diagnosis

## Explanations:

- This patient has symptomatic hyperglycemia without ketosis. His islet cell antibody profile is negative, and therefore he does not have type 1 diabetes mellitus. His T lymphocytes are immunoreactive to islet cell antigens. He, therefore, has a subtype of latent autoimmune diabetes (LADA) termed T-LADA.
- In the United Kingdom Prospective Diabetes Study(UKPDS), a subset of patients with a presumed diagnosis of type 2 diabetes mellitus had negative islet-cell antibodies but immunoreactive T lymphocytes to islet-cell antigens. This has been subsequently reported from other studies.
- T-LADA patients have a lower stimulated C-peptide response when compared to the type 2 diabetes mellitus group without immunoreactive T lymphocytes. The T-LADA patients went on to require insulin earlier than the subset of type 2 diabetes mellitus without such T lymphocytes but much later than type 1 diabetes mellitus. It has been suggested that T lymphocyte reactivity to islet-cell antigens may help to classify diabetes more accurately.
- Latent autoimmune diabetes of adult patients does not require insulin at least six months after the initial diagnosis. They do not have ketosis on the initial diagnosis and shortly after that. The insulin requirement is usually after an average of five years. Oral agents like DPP4 inhibitors and thiazolidinediones may have a part to play in the treatment as they may have a role in delaying the beta-cell destruction. Sulfonylureas are contraindicated in latent autoimmune diabetes of adulthood as they hasten the destruction of beta cells.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Latent Autoimmune Diabetes

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## Question 456:

A 29-year-old woman with a past medical history of type 1 diabetes mellitus and miscarriage three months ago presents with palpitations, sweating, and heat intolerance. Vital signs show oxygen saturation 98% on room air, respiratory rate 16 per minute, heart rate 112 per minute, blood pressure 124/68 mmHg, and temperature 98 F. On examination, the patient has fine tremors when closing her eyes with outstretched hands. Lab results show thyroid-stimulating hormone 0.05 mU/L (0.5-5). What further test would be most useful to differentiate the likely diagnosis from Graves' disease?

## Choices:

1. Iodine uptake scan
2. Free T4
3. Total T3
4. Fasting blood glucose

## Answer: 1 - Iodine uptake scan

## Explanations:

- Graves' disease results in an increase in iodine uptake.
- Postpartum thyroiditis results in a decrease in iodine uptake.
- In postpartum thyroiditis, the TSH levels may initially be suppressed, but repeat testing is required to determine if the hypothyroid phase has set in.
- In Graves' disease, the TSH levels are usually undetectable, and protein-bound iodine is increased.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Postpartum Thyroiditis

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## Question 457: A 62-year-old female with a 12-year history of hypertension and rheumatoid arthritis presents to her provider. After a thorough evaluation, it is determined that the woman will discontinue her daily dexamethasone therapy as her arthritis symptoms are well controlled. She mentions to the clinician that she will also undergo a hernia repair the following week. Which of the following should be considered in this scenario?

## Choices:

1. The patient should receive a live attenuated vaccine prior to discontinuation
2. The patient should receive a tuberculin skin test before discontinuing treatment
3. There are no precautions or contraindications to discontinuation of dexamethasone
4. The surgery may put the patient at risk for adrenal insufficiency

## Answer: 4 - The surgery may put the patient at risk for adrenal insufficiency

## Explanations:

- Dexamethasone is a potent glucocorticoid that, when used in humans, suppresses the hypothalamus-pituitary-adrenal axis (HPA axis). During the patient's surgery, because the patient likely has HPA axis suppression, the patient's pituitary gland will not produce sufficient quantities of ACTH. The lack of ACTH will lower the levels of cortisol, which is required to maintain vascular tone. This puts the patient at risk for an adrenal crisis.
- Long-term use of dexamethasone will likely cause adrenal suppression, and abrupt discontinue may cause symptoms similar to adrenal failure.
- Short-term glucocorticoid therapy up to 3 weeks may be discontinued without taper.
- The amount of tapering may vary between patients, but a 5-10% decrease in dosage every few weeks is a common plan for tapering.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Dexamethasone

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## Question 458: A 30-year-old man recently diagnosed with type 2 diabetes mellitus presents to his clinician for review following a trial of lifestyle advice. Despite adherence to advice, his HBA1c remains high at 52 mmol/mol. The clinician performs a cardiovascular risk assessment to decide which therapy would be most suited to the patient. Which of the following parameters would correlate with the decision to begin repaglinide monotherapy?

## Choices:

1. Raised body mass index (BMI), raised blood pressure
2. Normal BMI, raised low-density lipoproteins
3. Raised BMI, raised inflammatory markers
4. Normal BMI, raised resting heart rate

## Answer: 4 - Normal BMI, raised resting heart rate

## Explanations:

- In studies comparing the treatment effect of repaglinide versus metformin monotherapy in diabetes mellitus type 2, repaglinide showed a greater impact in reducing the cardiovascular risk associated with a raised resting heart rate.
- Repaglinide is effective at reducing most risk factors associated with cardiovascular disease; however in trial comparison, metformin has proven to be more effective.
- Repaglinide has also been associated with a greater reduction in Amadori albumin levels than metformin. Amadori albumin is a glycated protein produced in high quantities during periods of hyperglycemia, and has been linked to many micro- and macro-vascular complications associated with diabetes.
- The mechanism of action of repaglinide does not lend itself to weight loss to the extent that metformin does. As such, metformin is often the first-line therapy utilized in patients with a raised BMI.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Repaglinide

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## Question 459:

A 50-year-old female presents to the clinic with complaints of disturbed sleep for the past three months. She wakes up from sleep with a chest discomfort followed by a sensation of heat spreading all over her body, associated with sweating, and palpitations. The symptoms improve when she switches on the fan and removes the blanket. Recently, the symptoms have been progressing in frequency and severity, and the patient is bothered by them. She denies snoring or abnormal movement of her legs. Her medical history is insignificant, and she is not on any medications. Her menstrual cycles have been irregular for the last three years, and the last period was 12 months ago. Her family history is only significant for hypertension in her mother. Physical examination is noncontributory, and her body mass index is 28 kg/mm2. She is physically active and walks daily for 30-45 minutes. Vitals show a pulse rate of 80/minute, blood pressure of 130/82 mm Hg, and oxygen saturation of 100%. Her laboratory tests are all within normal limits except for triglycerides 200 mg/dL (normal 150 mg/dL). What is the next step in the management of this patient?

## Choices:

1. Advise behavioral modification and sleep hygiene practices
2. Refer for an EKG and overnight polysomnography before initiating treatment
3. Start the patient on oral hormonal replacement therapy
4. Start the patient on transdermal hormone replacement therapy

## Answer: 4 - Start the patient on transdermal hormone replacement therapy

## Explanations:

- Women younger than 60 years or within ten years of menopause are candidates for hormone therapy as the risk of the adverse effect is minimal in this group.
- Transdermal therapy is the treatment of choice in women with diabetes, hypertriglyceridemia, migraines without aura, those with an increased risk for venous thrombosis, gall bladder disease, and liver disease.
- Behavioral modification may be effective in mild symptoms. For moderate to severe symptoms, this alone is not effective and will need hormone replacement therapy (HRT). Women with an intact uterus need combination therapy with both estrogen and progestin to protect against uterine cancer, while those who have undergone hysterectomy can receive estrogen alone.
- Oral route and transdermal routes are equally effective. Transdermal estrogen has a better risk profile for venous thrombosis and stroke, and has less of an effect on serum lipid concentrations. From history, the possibility of coronary artery disease and sleep disorders are extremely unlikely. Lab tests like blood count, prolactin, or thyroid function tests are done if non-menopausal causes of symptoms are suspected.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Postmenopausal Syndrome

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## Question 460:

A 42-year-old female presented to the clinic with chief complaints of cyclic pain in her breasts. History reveals that she has been taking paroxetine and sulpiride for her recently diagnosed depression. Her neurological examination was unremarkable. Her complete blood count, serum electrolytes, renal function tests, blood glucose levels, albumin level, protein levels, and total bilirubin levels were within a normal range. Urine r/e was normal. Her prolactin levels were markedly increased. Keeping in view her history, what is the cause of her increased prolactin levels?

## Choices:

1. Prolactinoma
2. Anti-depressive medication-induced hyperprolactinemia
3. Hypothyroidism induced hyperprolactinemia
4. Oral-contraceptive induced hyperprolactinemia

## Answer: 2 - Anti-depressive medication-induced hyperprolactinemia

## Explanations:

- Hyperprolactinemia is also defined as an increase in prolactin levels above the normal range.
- It is very common with the use of certain medications such as tricyclic antidepressants, monoamine oxidase inhibitors, anti-psychotics, antidepressants, oral contraceptives, or hormone replacement therapy.
- In the above scenario, the patient has been taking anti-depressants that lead us to the cause of hyperprolactinemia.
- Stopping the medications would treat the cause of hyperprolactinemia, and the prolactin levels will be within a normal range in 2 to 3 weeks.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hyperprolactinemia

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## Question 461:

A 30-year-old man with a past medical history of obstructive sleep apnea was referred to you given an incidental pituitary macroadenoma found on CT maxillary sinus. On physical examination, blood pressure was 160/90 mmHg, pulse rate was 74 beats/minute, his heigh was 195 cm (6 ft 4ins), and his weight was 95 kg (209 lb). The patient had frontal bossing, prognathism, coarse facial features, large hands and feet with multiple flat brownish macules all over his body, and three thyroid nodules are felt on examination. Laboratory results revealed ACTH 15 pg/ml (5-50 pg/ml), cortisol 18 ug/dl (10-20 ug/dl), free T4 1.1 ng/dl (0.8-1.8 ng/dl), IGF1 1100 ng/dl (106-277ng/dl), and hemoglobin A1C 8.2%. The growth hormone (GH) level did not suppress with oral 75 gm glucose challenge test. The patient underwent transsphenoidal surgery. Additionally, the patient has a history of cardiac murmur with a mass on the left atrium. He has been following up with a cardiologist since he was a child. Given the above presentation, he was referred for genetic analysis. What are the characteristics of the suspected genetic disease?

## Choices:

1. Growth hormone-secreting adenoma is seen in approximately 90% of the patients.
2. The flat brownish skin lesions are seen in about 50-80% of the patients.
3. The genetic disease is X-linked dominant.
4. Clinicians make a diagnosis when there are one or more cardinal manifestations confirmed by histology, biochemical testing, or imaging (in the absence of family history or confirmed genetic testing).

## Answer: 2 - The flat brownish skin lesions are seen in about 50-80% of the patients.

## Explanations:

- The patient had acromegaly, left atrial myxoma, multinodular goiter, and flat brownish skin lesions (lentiginosis), which lead to the diagnosis of Carney complex. It is a rare genetic disorder. Clinicians make a diagnosis when there are two or more cardinal manifestations confirmed by histology, biochemical testing, or imaging. If the patient has a germline PRKAR1A mutation and/or a first-degree relative affected by the Carney complex, a single manifestation is sufficient for the diagnosis. Lentiginosis (flat brownish skin lesions) is seen in about 50% to 80% of patients with the Carney complex. Lentiginosis are typically flat, poorly circumscribed, brownish to black macules located around the lips, eyelids, ears, and the genital area.
- The history of hypertension, type 2 diabetes (A1C >6.5%), obstructive sleep apnea, facial features with enlarged hands and feet are clues toward the diagnosis of acromegaly. IGF1 level was elevated. The diagnosis was confirmed by an oral glucose challenge test and macroadenoma on imaging. Treatment is transsphenoidal surgery. Clinical acromegaly is uncommon in patients with the Carney complex (seen in approximately 10% to 15% of patients).
- Left atrial mass and cardiac murmur are seen in patients with cardiac myxoma. Carney complex-associated myxomas can be located within any chamber of the heart and can be multiple and require surgical removal. Annual screening with cardiac ultrasound is needed in patients with the Carney complex.
- The Carney complex is an autosomal dominant syndrome. 50% of children will be affected. Approximately 25% of cases occur sporadically, as a result of a de novo mutation.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Carney Complex

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## Question 462:

A 4-year-old boy is brought by his parents to the clinic for a follow-up visit. He was diagnosed with salt-wasting crisis three weeks after birth and needed extended hospitalization. At that time, investigations revealed high serum potassium, low sodium, high renin, high aldosterone, and normal 17 hydroxyprogesterone. He has since been under the care of a panel of physicians. He has had frequent chest congestion and wheezing and 3 admissions for pneumonia. Currently, his growth velocity is reduced, and his sweat test shows increased sodium and chloride. The parents are worried that the same illness may affect other children born to them in the future. What is the best advice predicting the occurrence of similar illness in subsequent children born to this couple?

## Choices:

1. Every second child is likely to be affected
2. One in four children is likely to be affected
3. Only male children born to them are likely to be affected
4. The occurrence of a similar disease is only by chance and cannot be predicted

## Answer: 2 - One in four children is likely to be affected

## Explanations:

- This child has pseudohypoaldosteronism type 1 inherited in an autosomal recessive fashion (PHA 1 AR). In such children, there is a mutation in the genes coding for one of the subunits of the epithelial sodium channel.
- In this condition, these channels are affected in many organs apart from the kidney and include the lungs, sweat, and salivary glands, unlike the autosomal dominant type where the affliction is confined to the kidney.
- The clinical manifestations are seen in multiple organs. The patient is resistant to mineralocorticoid therapy and will need high amounts of salt substitution and complexity of care.
- In the autosomal recessive pattern of inheritance, a defective gene, each from both patents are needed for the disease to manifest in the proband. Therefore, each parent is a carrier carrying one defective gene. The occurrence of the disease in offspring from these carrier parents is one in four births.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hypoaldosteronism

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## Question 463:

A 53-year-old woman with a medical history of type I diabetes with continuous glucose monitoring, hypothyroidism, depression, and hypertension is brought to the hospital with dizziness. She was found in her home obtunded by her boyfriend who provided her with some juice and called EMS. The blood sugar level was found to be in the 28 mg/dL and she was given dextrose and glucagon. Her insulin pump and monitor were removed on site. Her insulin pump usually ran at a basal rate of 0.9-1.1 IU/h. When she regained consciousness in the hospital, she claimed to have noticed that since filling her new insulin supply recently, she had been having more episodes of hypoglycemia. She had also recently returned to work and been more active. She denies nausea, vomiting or decreased oral intake. She is given a dextrose infusion in the hospital and monitored overnight. In the morning, she starts to have profuse vomiting and has to be given ondansetron, and further labs are drawn to investigate. She is found to have an anion gap of 23 and a normal amylase, lipase, while the arterial blood gas is still in process. Urinalysis does not show any ketones. Which of the following laboratory tests is most likely to be misleading despite the patient's most likely diagnosis?

## Choices:

1. Serum amylase and lipase
2. Urine ketones
3. Arterial blood gas
4. Random blood glucose

## Answer: 2 - Urine ketones

## Explanations:

- The patient's clinical and laboratory presentation is most consistent with a diagnosis of diabetic ketoacidosis.
- Although ketone levels are generally elevated in diabetic ketoacidosis (DKA), a negative measurement initially does not exclude the diagnosis.
- Ketone laboratory measurements often use the nitroprusside reaction, which only estimates acetoacetate and acetone levels that may not be elevated initially as beta-hydroxybutyrate is the major ketone that is elevated.
- Serum amylase and lipase rule out pancreatitis and have no role in the diagnosis of ketoacidosis hence will not be misleading towards or away from the diagnosis. In ketoacidosis, the arterial blood gas usually indicates and acidemia. Blood glucose levels vary widely and can be low in starvation ketosis and high in DKA and are hence not used for the diagnosis.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Ketoacidosis

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 464:

A 67-year-old male with a past medical history of coronary artery disease with one stent placed 2007 presents to the clinic for erectile dysfunction onset 3 years ago. The patient associates fatigue and denies nocturnal penile tumescence. The patient is not a smoker or a drinker. What is the best treatment plan moving forward after a year of symptomatic treatment for the patient?

## Choices:

1. Morning testosterone level, estradiol, lipid profile, prostate-specific antigen (PSA), complete blood count (CBC), and complete metabolic panel (CMP)
2. Vitamin D
3. Check peak testosterone level 1 day after injection and trough level just prior to next injection
4. Morning testosterone level, CBC, CMP, estradiol, lipid profile

Answer: 1 - Morning testosterone level, estradiol, lipid profile, prostate-specific antigen (PSA), complete blood count (CBC), and complete metabolic panel (CMP)

## Explanations:

- Optimal peak testosterone levels are drawn 1 to 3 days after a testosterone injection. Since the baseline changes, it is recommended to check the first level only after 3 to 4 injections, which is typically about one month after starting therapy.
- The safest testosterone injection schedule is approximately 100 mg per week and then check peak levels. Identify a specific symptom to serve as a clinical guide to the adequacy of therapy and response. It may take 6 months for the patient to notice a clinical change in this symptom even after normal levels are maintained. Trying to give 200 mg every 2 weeks is more convenient but typically causes supernormal peak testosterone levels.
- There is little clinical value in checking a trough level. It usually is sufficient to monitor the peak levels, which are optimally at or slightly above the midpoint of the normal laboratory range. If the patient develops symptoms before his next shot, a small increase in dosage may be recommended.
- Check prostate-specific antigen and complete blood count for hematocrit every 6 to 12 months in addition to the peak testosterone levels since polycythemia is a possible complication.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Androgen Replacement

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## Question 465:

A 25-year-old woman presents to the clinic for follow-up of hyperlipidemia. She has had no improvement on atorvastatin therapy for markedly elevated total and LDL cholesterol. Her vital signs are all within normal limits. She also has yellow plaques on the extensor surfaces of multiple tendons. Repeat lipid profile shows elevated LDL cholesterol and total cholesterol. A current set of investigations is significant for anemia, elevated AST, and elevated serum LDH. Two years ago, her transaminases were within normal limits. Physical exam demonstrates dullness to percussion in the upper quadrants bilaterally. Which of the following is the most likely cause of the lab abnormalities in this patient?

## Choices:

1. Lipid-induced liver injury
2. Hemolytic anemia
3. Statin-induced liver injury
4. Cholestasis

## Answer: 2 - Hemolytic anemia

## Explanations:

- This patient most likely has sitosterolemia. Sitosterolemia can cause hemolytic anemia.
- Elevated LDH and AST are indicative of possible hemolysis.
- Transient elevations in LDH and AST are more likely to be from hemolysis than hepatic injury, especially in the setting of sitosterolemia and anemia.
- Cholestasis can sometimes falsely elevated phytosterol levels on panels, falsely suggesting sitosterolemia. Statins may not work in sitosterolemia, but they do not cause hepatic injury.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hereditary Sitosterolemia

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## Question 466: A 15-year-old-female presents for a routine examination for irregular menstruation. The physical examination reveals palpable uterus. The pelvic sonogram is noted for an incidental finding of a single descended gonad. What is the most likely etiology?

## Choices:

1. Mosaic 45, X/46, XY karyotype
2. Partial androgen insensitivity syndrome
3. Complete Androgen Insensitivity Syndrome
4. X-linked Dominant inheritance

## Answer: 1 - Mosaic 45, X/46, XY karyotype

## Explanations:

- 46, XY women with a uterus will be considered to have gonadal dysgenesis.
- Mixed gonadal dysgenesis (also termed chromosomal disorder of sex development [DSD], as the name suggests, is associated with a mosaic 45, X/46, XY karyotype and presence of single descended gonad should raise suspicion of this disorder.
- It presents with a dysgenetic testis on one side and a streak gonad on the other.
- Molecular genetic studies become imperative to diagnose complete androgen insensitivity syndrome (CAIS) or partial androgen insensitivity syndrome (PAIS). CAIS can be confirmed with genetic testing where the typical loss-of-function mutations in the coding sequence of the AR are located. The AR gene is located on chromosome Xq11-12.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Androgen Insensitivity Syndrome

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 467:

A 55-year-old female with a history of Graves disease presents to the office to discuss her longterm thyroid management options. She was previously treated with beta-blockers and also IV steroids for eye problems. What is the best therapy for this patient's thyroid disease?

## Choices:

1. Radioiodine
2. Total thyroidectomy or thionamide
3. Subtotal thyroidectomy
4. Orbital radiation followed by radioiodine

## Answer: 2 - Total thyroidectomy or thionamide

## Explanations:

- This patient has moderate-to-severe clinically active Graves eye disease as she was currently treated with IV steroids, and the best treatment choice would be either total thyroidectomy or the use of thionamide drugs.
- Patients with moderate-to-severe Graves orbitopathy have a contraindication to radioiodine therapy.
- Total thyroidectomy is preferred over subtotal thyroidectomy as more autoantigens can be removed.
- Antithyroid medications, like methimazole and propylthiouracil, can be used in the initial phase when the thyrotoxicosis is present, and later surgery can follow.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Graves Orbitopathy

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 468: A 70-year-old man with a recent history of total thyroidectomy presents for a follow-up visit. Surgical note reported gross tumor invasion to the perithyroidal tissues. The current thyroglobulin level is 20 ng/mL, and the radioiodide (RAI) whole-body scan is negative. The clinician is concerned about recurrent disease. Which of the following is the next best step in the management of this patient?

## Choices:

1. FDG PET/CT
2. F DOPA PET/CT
3. I-124 PET/CT
4. Ga-DOTATOC PET/CT

## Answer: 1 - FDG PET/CT

## Explanations:

- Distinct metabolic behaviors can be identified with PET/CT to distinguish different tumor subtypes during post-treatment evaluations. Well-differentiated carcinomas express aberrant but functional sodium-iodide symporters facilitating iodide uptake in RAI scan. Conversely, poorly differentiated carcinomas would not express the same structural and functional characteristics and result in a negative scan.
- Poorly differentiated carcinomas have high metabolic activity with increased glucose uptake mediated by overexpression of GLUT-1 transporters in their cellular membrane. The use of fluorodeoxyglucose (FDG) as a tracer in PET/CT takes advantage of this scenario to detect malignant disease.
- FDG PET/CT has an 80% sensitivity and specificity for detection of recurrent disease, especially associated with poorly differentiated carcinomas, in patients with elevated thyroglobulin levels and negative RAI scan.
- F DOPA PET/CT has a 70-80% sensitivity for detection of recurrent or metastatic and is superior to FDG PET/CT for the diagnosis of medullary carcinoma. Additional radiotracers targeting somatostatin receptors like Ga-DOTATEC are used in the evaluation of neuroendocrine tumors.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Nuclear Medicine PET/CT Thyroid Cancer Assessment, Protocols, And Interpretation

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## Question 469: A 45-year-old male was recently found to have an elevated calcium level of 11 mg/dl (normal 8.5 to 10 mg/dl) in his routine blood check. His parathyroid hormone level is 120 pg/ml. He also has low blood glucose, feels sweaty and dizzy, but symptoms are relieved after ingestion of glucose. What is the best next step in the management of this patient?

## Choices:

1. 24-hour urinary calcium
2. CT abdomen with IV contrast
3. 72-hour fasting insulin level
4. Observation for 4 weeks for blood glucose control

## Answer: 3 - 72-hour fasting insulin level

## Explanations:

- The triad described in this patient is known as Whipple triad, symptoms of hypoglycemia, hypoglycemia, and relief of symptoms following the ingestion of glucose, due to possible insulinoma.
- Endocrine tumors of the gastro-entero-pancreatic (GEP) tract (insulinoma), Parathyroid tumors, pituitary tumors, are the main MEN1-associated endocrinopathy. This patient is suspected of having MEN-1 syndrome. A molecular genetic test is necessary to diagnose MEN-1 syndrome.
- Before imaging or genetic testing, biochemical confirmation of insulinoma is performed with a 48-hr or 72-hr fasting insulin level.
- The molecular genetic test is necessary to diagnose MEN-1 syndrome before surgery. Hyperparathyroidism of MEN-1 syndrome is treated with subtotal parathyroidectomy.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Parathyroidectomy

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## Question 470:

A 17-year-old female patient with no significant past medical history presents to the emergency department with lethargy, confusion, dry mucous membranes, and a pale, emaciated appearance. A fruity odor to the breath is present. An arterial blood gas reveals a pH of 6.95, bicarbonate 9.6 mEq/L, and potassium 4.3 mEq/L. Based on this clinical scenario, she is started on the appropriate treatment plan. Which of the following would indicate the resolution of the underlying diagnosis?

## Choices:

1. Serum bicarbonate above 20 mEq/L
2. Blood sugar between 80 to 120 mg/dl
3. Urine dipstick negative for ketones
4. Normal anion gap

## Answer: 4 - Normal anion gap

## Explanations:

- High anion gap acidosis is the hallmark of DKA in conjunction with hyperglycemia and ketone production. The patient can still have acidosis after the resolution of DKA, mainly because of increased chloride administration. The acidosis at this point will be non-anion gap hyperchloremic acidosis. DKA can be considered resolved if the patient has a normal anion gap and serum bicarbonate of over 15 mEq/L. Serum bicarbonate may not be normal even after diabetic ketoacidosis (DKA) is resolved because of increased chloride administration in intravenous fluids and hyperchloremia. However, Bicarbonate should at least be above 15- to 16 mEq/L.
- High anion gap acidosis is the hallmark of DKA in conjunction with hyperglycemia and ketone production. The patient can still have acidosis after the resolution of DKA mainly because of increased chloride administration. The acidosis at this point will be non-anion gap hyperchloremic acidosis. DKA can be considered resolved if the patient has a normal anion gap and serum bicarbonate of over 15 mEq/L.
- Blood sugar may not be normalized when DKA is resolved. It is important to avoid hypoglycemia. Therefore, the goal of treatment of DKA should not focus on the strict correction of hyperglycemia.
- Ketone bodies will be elevated in DKA. It is prudent not to monitor this to diagnose DKA resolution because patients cannot produce a sample every 2 hours. Additionally, urinary ketone does not quantitatively represent blood ketone production.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Adult Diabetic Ketoacidosis

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 471: A 30-year-old female patient presents to the endocrinology clinic to discuss her blood glucose levels taken at home. She has been diagnosed with type 1 diabetes for 15 years now. The patient states that she checks her blood glucose every morning, before her meals, and before bedtime. She says that she has been waking up early in the morning with increased urgency to use the bathroom. She has increased thirst in the morning as well, no matter how much water she drinks. She has also noted her blood glucose in the mornings to be over 150 mg/dL even though her blood glucose is near 60 mg/dL the nights before. What phenomenon is this patient experiencing?

## Choices:

1. An episode of hypoglycemia followed by hyperglycemia in the mornings
2. An episode of hyperglycemia followed by hypoglycemia in the mornings
3. Diabetic ketoacidosis with low sugars
4. Microalbuminuria with no renal dysfunction

## Answer: 1 - An episode of hypoglycemia followed by hyperglycemia in the mornings

## Explanations:

- The Somogyi effect is a rebound high blood sugar after an episode of hypoglycemia.
- This controversial theory was put forward many years ago and there was some doubt about its existence.
- A patient with type 1 diabetes mellitus will develop hypoglycemia at night from a dose of insulin. The body then responds by rebounding with hyperglycemia as a defensive mechanism. The doctor looks at the patient in the morning and notices that there is high sugar and starts more insulin, thus compounding the effects.
- However, monitoring of patients with type 1 diabetes mellitus has shown that people who develop hypoglycemia do not necessarily develop hyperglycemia.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Somogyi Phenomenon

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## Question 472: A 65-year-old chronic diabetic male presents with right foot warmth, redness, and swelling. The patient was not aware of the change in his foot as he is neuropathic and admits to not examining his feet often. On physical examination, there is no sign of ulceration, pedal pulses are bounding, and laboratory workup reveals a white cell count of 8.7 cells/microliter. The foot radiograph shows osteopenia and fragmentation with osseous joint changes at the tarsometatarsal joint. What is the pathophysiology of the suspected diagnosis?

## Choices:

1. Neurovascular changes and microtrauma
2. Poorly fitted footwear leading to irritation and trauma
3. Repetitive trauma secondary repeated loading or force on the midfoot
4. Muscular atrophy and arthritic changes

## Answer: 1 - Neurovascular changes and microtrauma

## Explanations:

- Charcot neuroarthropathy (CN) is a possible manifestation of diabetic peripheral neuropathy, likely caused by both neurovascular changes (i.e., arteriovenous shunting causing increased blood flow, which leads to increased monocyte and osteoclast activity, increasing bone resorption, osteopenia, bone destruction) and micro-trauma.
- Differential diagnosis of Charcot neuroarthropathy is an infection (e.g., cellulitis, osteomyelitis). White blood cell count is usually elevated in these differentials.
- A commonality in Charcot neuroarthropathy is bounding pedal pulses (due to increased blood flow) and neuropathy (leading to microtrauma).
- Charcot neuroarthropathy foot x-rays often show fragmentation and osteopenia. The most common site of collapse in Charcot's foot is the tarsometatarsal joint.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Diabetic Foot Care

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## Question 473:

A 68-year-old man presents to the clinic with bradykinesia, rigidity, and a resting tremor. These symptoms have returned despite five years of successful treatment with levodopa/carbidopa. The physician recommends a medication to take in addition to levodopa/carbidopa. He explains that this additional medication acts directly on the same receptors as the neurotransmitter produced naturally by the substantia nigra. Which of the following diseases is also indicated for treatment with this recommended adjunct medication?

## Choices:

1. Schizophrenia
2. Huntington Disease
3. Alzheimer Disease
4. Acromegaly

## Answer: 4 - Acromegaly

## Explanations:

- Bromocriptine mesylate exhibits potent dopamine receptor agonist activity. It is an ergot alkaloid derivative.
- In Parkinson disease, bromocriptine binds directly to striatal dopamine D2 receptors, stimulating locomotion and attenuating the bradykinetic symptoms caused by the degeneration of dopaminergic nigrostriatal neurons.
- In acromegaly, bromocriptine's dopaminergic effect can cause paradoxical blocking of GH release through tuberoinfundibular pathways, decreasing circulating levels of GH.
- Dopamine agonism is not a current strategy in the treatment of schizophrenia, Huntingdon disease, or Alzheimer disease.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Bromocriptine

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## Question 474:

A 25-year-old woman presents to the emergency department with a chief complaint of nausea, vomiting, and diarrhea. Her vital signs include blood pressure 98/60 mmHg, pulse 110/min, respiratory rate 18/min, and temperature 98.2 F. She is alert and oriented and is in no acute distress. Her physical exam findings include dry mucous membranes, heart sounds are tachycardic and regular, and her abdomen is soft and non-tender with hyperactive bowel sounds. Her home medication list includes dietary supplements only. She reluctantly mentions to the nurse that she recently started a new diet which consists of only eating seaweed. She has been ingesting seaweed eight to ten times per day for the past week. Which of the following is the next best step in the management of this patient?

## Choices:

1. Reassurance
2. Activated charcoal
3. Deferoxamine
4. Gastric lavage

## Answer: 2 - Activated charcoal

## Explanations:

- Iodine can be found in dietary supplements. Foods containing iodine include iodized salt, drinking water, milk, certain seafood, and seaweeds.
- There is no specific antidote to iodine poisoning; therefore, management is largely supportive. If the patient is stable, alert, and protecting their airway, activated charcoal should be given to decontaminate the gastrointestinal tract.
- The patient may require hospitalization or prolonged observation in the emergency department until deemed medically stable.
- Gastric lavage is a gastric decontamination procedure that is rarely performed. In a patient with altered mental status or potential for aspiration, it should be avoided. Deferoxamine is an antidote used in iron overdose and naloxone is used in opiate overdose.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Iodine Toxicity

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## Question 475:

A 12-year-old male presents to the clinic with multiple bony swellings over the back, chest, and both arms for the past four years. On examination, he has bilateral hallux valgus with macrodactyly of the great toes in both feet. Which type(s) of muscle is involved in this patient's suspected condition?

## Choices:

1. Smooth muscle
2. Skeletal muscle
3. Smooth muscle and skeletal muscle
4. Cardiac muscle

## Answer: 2 - Skeletal muscle

## Explanations:

- The history and physical findings in this patient are suggestive of fibrodysplasia ossificans progressiva (FOP).
- In FOP, heterotopic ossification occurs in various skeletal muscle groups.
- Certain skeletal muscle groups are not involved, including the diaphragm, extra-ocular muscles, and tongue.
- Cardiac muscle and smooth muscle are characteristically spared in this very rare genetic disorder.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Fibrodysplasia Ossificans Progressiva

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 476: A 42-year-old man with recently diagnosed primary sclerosing cholangitis is found to have an LDL level of >440 mg/dL on routine testing. He is not taking any medication. Which of the following is the next best step in the management of this patient?

## Choices:

1. Atorvastatin
2. Ezetimibe
3. Prednisone
4. Low-fat diet

## Answer: 3 - Prednisone

## Explanations:

- This patient has primary sclerosing cholangitis, which causes hyperlipidemia. The management is to treat the PSC, and the hyperlipidemia will resolve.
- Other causes of liver dysfunction like cholestasis should undergo ERCP and biliary stent placement.
- Lipoprotein-X induced hyperlipidemia does not require lipid-lowering therapy as the LDL level is falsely elevated.
- Lipoprotein-X induced hyperlipidemia does not cause an increased risk of atherosclerosis.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Lipoprotein X Induced Hyperlipidemia

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## Question 477:

A 65-year-old male presents to the emergency department with high-grade fever, drowsiness, and decreased urine output. His past surgical history is significant for a splenectomy that was performed 10 years ago after a motor vehicle collision. His blood pressure is 90/60 mm Hg, pulse rate is 110/min, the temperature is 102 F, respiratory rate is 30/min, and oxygen saturation is 98% with 2 L/min of oxygen. Blood cultures are obtained. He is diagnosed with a case of pneumococcal sepsis. He is transferred to the intensive care unit. On physical examination, there is a delayed relaxation phase of deep tendon reflexes of the knee bilaterally. Laboratory analysis reveals a decreased Serum T3. The patient may have which of the following?

## Choices:

1. Graves disease
2. Low T3-low T4 syndrome
3. Increased concentration of thyroxin binding globulin
4. Subacute thyroiditis

## Answer: 2 - Low T3-low T4 syndrome

## Explanations:

- Critically ill patients may have low T3 without having thyroid disease.
- Thyroiditis, increased thyroxin binding globulin, and Graves disease would have an elevated T3.
- The levels of TSH do vary in euthyroid sick syndrome but in the majority of patients, the levels are normal.
- To date, no study has shown that there is any benefit or harm from the use of thyroid hormone replacement therapy in these patients. The topic remains controversial.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Euthyroid Sick Syndrome

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## Question 478:

NPH insulin 20 units and regular insulin 6 units have been prescribed for a patient every morning. The patient is on a sliding scale dosage for coverage of blood sugar patterns. The patient's 7 am blood sugar was 200 mg/dl. This blood sugar level requires coverage with 6 units of regular insulin. What is the appropriate insulin dosage for this patient at this time?

## Choices:

1. 20 units of NPH; 6 units of regular
2. 20 units of NPH; 12 units of regular
3. 26 units of NPH; 6 units of regular
4. 26 units of NPH; 12 units of regular

## Answer: 2 - 20 units of NPH; 12 units of regular

## Explanations:

- The patient should receive 20 units of NPH and 12 units of regular. Six units of regular insulin should be added to the standard morning dosage of 6 units to manage the blood sugar pattern.
- 20 units of NPH; 6 units of regular does not include the sliding scale coverage and would be an insufficient dosage at this time.
- 26 units of NPH; 6 units of regular is an overdosage of NPH and an insufficient dosage of regular.
- 26 units of NPH; 12 units of regular the regular insulin dosage is correct, but the NPH dosage is an overdosage. If the patient's fasting blood sugar is consistently high, the morning NPH should be increased.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Diabetes Mellitus Type 1

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## Question 479: A couple finds their otherwise healthy 2-month-old male infant in the bed, unresponsive. Emergency responders arrive and pronounce him dead. After a thorough investigation, his cause of death is found to be a metabolic disease. Which of the following processes is dysfunctional in the particular metabolic disease that is most commonly responsible for this outcome?

## Choices:

1. Oxidation
2. Generation of ATP
3. Anaerobic respiration
4. Exon splicing

## Answer: 1 - Oxidation

## Explanations:

- The most common metabolic disease that can cause a sudden death has a dysfunction with oxidation, mainly with the fatty acids. The most common metabolic disease is medium-chain acyl-CoA dehydrogenase (MCAD) deficiency.
- The autopsy may be able to identify abnormal metabolites in the body, but the incomplete autopsy may fail to identify such and classify deaths as SIDS. A cause of death is found in up to 15% of suspected SIDS via an autopsy.
- Clinical features suggestive of metabolic disease include a history of SIDS or unexpected death in a sibling, family history of sibling or cousin with ALTE, Reye syndrome, or myopathy, and signs/symptoms prior to death including failure to thrive, vomiting, hypoglycemia, hypotonia, hyperventilation, serious infections, or elevated aminotransferase levels.
- The proportion of metabolic diseases was not higher among infants with sudden death compared to the general population of infants.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Sudden Infant Death Syndrome

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## Question 480:

A 65-year-old woman presents to the clinic for follow-up. She was in the hospital a week ago for her second stroke in two years. She also has a history of hypertension and type 2 diabetes. Her daily medications are aspirin, atorvastatin, lisinopril, and glimepiride. Her carotid Doppler during her last admission showed 35% and 78% stenosis of the left and right internal carotid arteries, respectively. She has refused to consider surgical management to prevent future cerebrovascular disease. Decreasing which of the following foods from her diet is most likely to reduce the risk of worsening her underlying disease?

## Choices:

1. Rice
2. Legumes
3. Fish
4. Fried foods

## Answer: 4 - Fried foods

## Explanations:

- The patient should be recommended to adopt a low-fat diet due to her significant carotid stenosis, which puts her at an increased risk for recurrent cerebrovascular disease.
- There has been a direct relationship between dietary fat intake and cardiovascular disease (CVD). Dietary cholesterol has been a focus of considerable attention due to a direct connection between diet and blood cholesterol levels and the subsequent risk for coronary artery disease.
- There is abundant literature to suggest that a decrease or modification of serum cholesterol is a possible way to prevent atherosclerosis. Decreasing the amount of fat intake is an effective means of lowering the serum cholesterol concentration. Hence, a low-fat diet has been widely advocated by clinicians for reducing the cardiovascular-related morbidity and mortality of their patients.
- Trans fatty acids are similar to saturated fatty acids in raising cholesterol, as well. The level of saturated fats, trans-fatty acids should be low, and the levels of polyunsaturated fatty acids should be high. Cheese is rich in saturated fats and should be avoided in patients at risk of cardiovascular disease.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Low Fat Diet

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## Question 481:

A 50-year-old male with a past medical history of hypertension presents to the clinic for progressive muscle weakness. He first noticed cramping in his left hand, especially when washing the dishes. He also states for the last 2 months, he has been dragging his right foot and experiencing more falls than usual. The patient denies bowel nor bladder incontinence. Family history is significant for neurodegenerative disease in his grandfather and uncle. Physical exam reveals atrophy of the left intrinsic hand muscles and decreased muscle tone in the lower extremities bilaterally. Right foot drop is present, and hyperreflexia is noted on deep tendon reflexes. Positive Hoffman and Babinski signs are evident bilaterally. MRI of the brain was negative. Nerve conduction studies reveal intact sensory, and electromyography (EMG) demonstrated fibrillations and positive sharp waves. What is the next preferred management?

## Choices:

1. Check the serum catalase
2. Check the serum superoxide dismutase
3. Check the serum glutathione peroxidase
4. Check the serum peroxidase level

## Answer: 2 - Check the serum superoxide dismutase

## Explanations:

- The patient presentation is most consistent with amyotrophic lateral sclerosis (ALS), specifically familial ALS. ALS can be caused by a defect in superoxide dismutase 1. ALS is a combined UMN and LMN degeneration.
- Antioxidants can be small organic molecules or enzymes such as superoxide dismutase.
- Both catalase and superoxide dismutase help prevent the Haber-Weiss reaction by lowering cellular levels of hydrogen peroxide and superoxide radicals, respectively.
- Superoxide dismutase is a metalloprotein with one form having Cu and Zn (Cu/Zn-SOD1) and another having Mn (Mn-SOD2). Mn-SOD2 is present in mitochondria.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Biochemistry, Antioxidants

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## Question 482:

A 52-year-old Caucasian woman with end-stage renal disease on hemodialysis, hypertension, diabetes mellitus type 2 presents the clinic for follow up. She had lab work done last week which showed hemoglobin of 11 g/dL, calcium 10.5 mg/dL, phosphorus 6 mg/dL, PTH 980 mg/mL, and albumin 4.1 gm/dL. The patient complains of bone pain and generalized weakness. Medications include insulin, amlodipine, losartan, metoprolol succinate, cinacalcet, vitamin D, and calcium. Her medications have not been changed for more than a year and are deemed to be at maximum dosages. What is the next best step in the management of this patient?

## Choices:

1. Check vitamin D level
2. Stop cinacalcet and start phosphate binders
3. Bilateral neck exploration of parathyroidectomy
4. Order FNA biopsy of the parathyroid gland

## Answer: 3 - Bilateral neck exploration of parathyroidectomy

## Explanations:

- This is a case of severe secondary hyperparathyroidism resistant to cinacalcet treatment. The patient is on maximal doses of cinacalcet, and still, the PTH level is high.
- Since the patient has not been responding to cinacalcet treatment, the next step is to consider parathyroidectomy.
- Neck exploration is done as part of parathyroidectomy. Parathyroidectomy is reserved for severe secondary hyperparathyroidism resistant to medical management.
- The patient is already on vitamin D supplementation and calcium supplementation. Checking vitamin D levels is not useful as PTH is still high. Phosphate binders would not be useful. FNA biopsy is not needed for secondary hyperparathyroidism.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Secondary Hyperparathyroidism

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## Question 483:

A 30-year-old G1P0 woman presents at 8 weeks of gestation for four weeks of unintentional weight loss, anxiety, sweating, and palpitations. She denies significant nausea or vomiting. Past medical history is noncontributory. Relevant family history includes hypothyroidism in her mother. Her pulse rate is 126 beats/min, blood pressure 135/85 mmHg, respiratory rate 18/min, and temperature 99 F (37.3 C). Physical examination reveals moist skin, a smooth, symmetrical goiter without tenderness to palpation, tachycardia, fine bilateral tremor, and exaggerated deep tendon reflexes. An ECG demonstrates sinus tachycardia. What is the most appropriate next step in management while awaiting laboratory results?

## Choices:

1. Diltiazem
2. Potassium iodide
3. Propylthiouracil (PTU)
4. Propanolol

## Answer: 4 - Propanolol

## Explanations:

- This patient is presenting with classic signs and symptoms of thyrotoxicosis including tachycardia, palpitations, tremors, weight loss, anxiety, and heat intolerance. Although hyperthyroidism is suspected based on her clinical presentation, the diagnosis must be established before initiating directed therapy. Therefore, the initial management is to treat her tachycardia with a beta-blocker, such as propranolol.
- Beta-blockers may be used to control hypermetabolic symptoms until euthyroidism is achieved. In the majority of patients, they can be discontinued within six weeks. Long-term treatment with beta-blockers in pregnancy has been associated with an increased risk of fetal complications such as intrauterine growth restriction and neonatal hypoglycemia.
- Beta-blockers are preferred over calcium channel blockers, like diltiazem, because they provide relief from the adrenergic symptoms of hyperthyroidism such as tremor, heat intolerance, and anxiety, as well as slow heart rate.
- Once the diagnosis of hyperthyroidism has been established, directed therapy with thionamides can be considered. Propylthiouracil (PTU) is preferred during the first trimester of pregnancy due to the risk of teratogenicity associated with methimazole, including aplasia cutis and choanal or esophageal atresia. Potassium iodide is used in the treatment of thyroid storm and would not be appropriate for this patient.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Thyrotoxicosis

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## Question 484:

A 65-year-old male with a history of hypertension, coronary artery disease, and severe congestive heart failure with reduced ejection fraction who recently underwent cardiac transplantation is evaluated for persistent low back pain. The patient is on an immunosuppressive regimen that includes high-dose steroids. His hemoglobin level is 12.8 g/dl, BUN is 22 mg/dl, serum creatinine is 1.3 mg/dl, calculated GFR is 70 ml/min, calcium is 9.8 mg/dl, albumin level is 3.5 g/dl and morning serum total testosterone levels checked twice on different days are 140 ng/dl and 172 ng/dl. X-ray of the lumbar spine reveals a compression fracture at the level of the T12 vertebra. Bone densitometry shows T-scores of -2.8 at the lumbar spine and -1.8 at the femoral neck. Which of the following is the most appropriate choice of treatment for this patient's osteoporosis?

## Choices:

1. Alendronate
2. Testosterone replacement therapy
3. Calcitriol
4. Denosumab

## Answer: 1 - Alendronate

## Explanations:

- Bisphosphonates are the first-line therapy for osteoporosis in all men and post-menopausal women with normal renal function.
- Hormone replacement therapy alone is not adequate for the treatment of documented osteoporosis in patients with hypogonadism. There is evidence that suggests that HRT can be used as an adjunct to definitive therapy with bisphosphonates in such patients after considering the risks associated with replacement.
- Hypogonadism has been shown to occur in the months following transplantation, more frequently in cardiac and bone marrow transplant recipients. This has been attributed to suppression of the hypothalamic-pituitary-gonadal axis by high dose glucocorticoids.
- Although some studies have shown that denosumab therapy is effective for treating post-transplantation osteoporosis, particularly in renal transplant recipients, it is not the first-line therapy for patients with acceptable renal function.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Transplantation Osteoporosis

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## Question 485:

A 66-year-old man presents to the clinic for a routine follow up visit. He has a history of type 2 diabetes mellitus and silicosis. He is currently taking metformin at the maximum recommended dose, but his HbA1c has remained above 10%. Another oral diabetic agent is started that acts to increase insulin sensitivity via activation of nuclear transcription regulation. Which of the following tests is most appropriate to be performed before starting this new medication?

## Choices:

1. Ejection fraction
2. Liver function
3. Finger stick blood glucose
4. Bone mineral density scan

## Answer: 2 - Liver function

## Explanations:

- Hepatotoxicity is a long-term risk of some thiazolidinediones. For this reason, it is recommended that LFTs be checked before starting treatment.
- Additional follow up tests, and evaluation for symptoms of liver failure should be made at follow up appointments.
- Reduced ejection fraction may be indicative of heart failure, which would be a contraindication to starting PPAR-gamma activators (thiazolidinediones). However, ejection fraction is not something that is routinely measured before starting treatment. Symptoms and risk of heart failure should be evaluated and monitored throughout treatment.
- Fingerstick blood glucose would not be needed as the patient has recorded HbA1c levels, which will more accurately follow the patient's glycemic control over the long term. Increased fracture risk is an adverse effect of thiazolidinediones. However, bone density scans are not routinely checked before starting these medications. Risk factors for osteoporosis, such as postmenopausal female or long-term use of PPIs, corticosteroids, or heparin, should all be considered before starting thiazolidinedione therapy.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Thiazolidinediones

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## Question 486:

A 54-year-old woman presents to the clinic with difficulty losing weight after attempting weight loss programs and 3-times per week aerobic physical activity. She has a history of hypertension, bilateral knee osteoarthritis, atrial fibrillation on warfarin, and a seizure disorder since childhood. She has regained weight many times after the initial loss and is now seeking medical therapy to help her achieve her goals. She denies any compulsive behavior, smoking, or drug use and admits to drinking 2 beers on the weekends. Her other medications are losartan and hydrochlorothiazide. On physical exam, Her BMI is 34 kg/m2, blood pressure 135/89 mm Hg, and pulse 98/min. She has an irregular rhythm on cardiac auscultation. Her labs are significant for fasting glucose of 98 mg/dL, serum creatinine 1.0 mg/dL, thyroid-stimulating hormone 1.6 mIU/L, total cholesterol 156 mg/dL, and LDL 78 mg/dL. Which of the following is the best initial therapy for this patient?

## Choices:

1. Phentermine-topiramate
2. Bupropion-naltrexone
3. Liraglutide
4. Orlistat

## Answer: 3 - Liraglutide

## Explanations:

- This patient has medical indications to be started on weight-loss therapy for improvement of her obesity-related comorbidities, in this case, osteoarthritis of the knees and hypertension.
- Indications for pharmacologic therapy include BMI 30 kg/m2 or BMI 27 kg/m2 in the presence of other risk factors (e.g., hypertension, diabetes, dyslipidemia).
- Considering that she has absolute or relative contraindications to all the other classes of medications, liraglutide would be her best choice as a weight-loss drug, also being approved for patients without diabetes.
- The combination of phentermine-topiramate should be used carefully in patients with arrhythmias or with baseline tachycardia since the combination has the potential side effect to increase heart rate. Studies have not shown any major complications related to the slight increase in heart rate, but in this patient with a baseline heart rate of 98/min, this would not be the preferred first choice. Bupropion-naltrexone is contraindicated in patients with a history or current seizure disorder due to the potential effect of bupropion to lower the seizure threshold. Orlistat would not be preferred in this case due to the known effect of lowering liposoluble vitamins, including vitamin K, which potentially could increase the international normalized ratio in a patient taking warfarin. It is also known to cause rare liver injury.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Pharmacologic Therapy For Obesity

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## Question 487:

A 36-year-old patient presents to the emergency department (ED) with severe epigastric pain and vomiting. He is diagnosed with acute alcoholic pancreatitis and subsequently admitted to the ICU. He requires vasopressors for hemodynamic instability and is being mechanically ventilated. He is kept nil-per-os (NPO), and total parenteral nutrition supplementation (TPN) is initiated. After one week of TPN supplementation with no improvement of pancreatitis, a feeding jejunostomy is placed. Twenty-four hours after initiation of jejunal tube feeds, he is noted to be hypotensive and has high peak pressure changes on the ventilator. An arterial blood gas (ABG) is suggestive of metabolic alkalosis. Which of the following is associated with this acute change in the patient's condition?

## Choices:

1. Hypophosphatemia
2. Hypermagnesemia
3. Hypocalcemia
4. Hyperkalemia

## Answer: 1 - Hypophosphatemia

## Explanations:

- This patient has developed refeeding syndrome as a result of the initiation of enteral feeds after a state of prolonged starvation (1 week). Hypokalemia, hypophosphatemia, and hypomagnesemia are found in refeeding syndrome.
- Potassium, phosphorous, and magnesium are driven intracellularly in refeeding syndrome. There is no effect on calcium transport.
- Refeeding syndrome commonly presents in the ICU and manifests as hypotension, heart failure, respiratory failure, or renal failure.
- Slow initiation of enteral feeds is critical in preventing refeeding syndrome.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Feeding Jejunostomy Tube

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## Question 488:

A 23-year-old college student is admitted to the ICU for fever, headache, vomiting, and neck stiffness. Examination shows blood pressure 110/70 mmHg, a pulse of 120 beats per minute, a respiratory rate of 22/min, and a temperature of 101 degrees Fahrenheit. There is a diffuse purpuric eruption on his trunk and extremities. He is diagnosed as a case of meningococcal meningococcemia, and appropriate therapy is instituted. On the third post-admission day, he develops new abdominal pain and hypotension. His investigations show a sodium level of 130 mmol/l, a potassium level of 6.1 mmol/l, and a bicarbonate level of 15 mEq/l. Which of the following describes the most likely finding to be seen on his abdominal CT scan?

## Choices:

1. Hyperdense adrenal enlargement without contrast enhancement
2. Hypodense adrenals with calcifications
3. Unilateral adrenal enlargement with a fatty component
4. Bilateral adrenal masses with contrast enhancement

## Answer: 1 - Hyperdense adrenal enlargement without contrast enhancement

## Explanations:

- This patient has been diagnosed with disseminated meningococcal infection. A gram-negative diplococcus is an important cause of meningitis, especially in individuals living in dormitories. Neisseria meningitides can cause disseminated infection and can present with a purpuric rash. An important complication that occurs is bilateral adrenal hemorrhage, termed Waterhouse Frederichson syndrome.
- Waterhouse Frederichson syndrome can present with diffuse abdominal pain and the development of hypotension in a patient with meningococcemia. Other signs of adrenal insufficiency may be present. Investigations may reveal a fall of hemoglobin/hematocrit and the classic hyponatremia, hyperkalemia, and hypoglycemia associated with adrenal insufficiency. Low serum cortisol and elevated ACTH further aids in the diagnosis.
- A CT scan is important in the diagnosis of adrenal hemorrhage. It shows heterogeneous round to ovoid lesions without enhancement. There are often peri-adrenal inflammatory changes and possibly fat stranding. The adrenals appear hyperdense but without any contrast enhancement. The hematoma may also extend into the perinephric space. Over time, the hematoma appears less dense on subsequent CT scans and may develop calcifications. This explains the CT findings of reduced density of the adrenals and calcifications, which are seen in chronic adrenal hematomas.
- Overall, adrenal hemorrhage is associated with a 15% mortality rate, which varies according to the severity of the bleed. This increases to a 55 to 60% mortality rate in patients with Waterhouse-Friderichsen syndrome (adrenal hemorrhage can be due to meningococcal sepsis). Treatment would be dependent on the severity, but in general, corticosteroid replacement should be used for adrenal insufficiency. Adrenal enlargement with a significant fatty component is seen in angiomyolipomas. Adrenal lesions with contrast enhancement are seen in cases of neoplastic deposits.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Adrenal Hemorrhage

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## Question 489:

A 65-year-old woman presents to the clinic for her annual checkup. She has no current complaints. The general physical and systemic examination is unremarkable. Her blood pressure is 130/90 mmHg, pulse 80/mi, and temperature 37.4 °C. Her home glucose chart shows poorly controlled readings and the clinician orders an HbA1c, which is found to be 7.9%. The addition of alogliptin is considered. Which of the following best describes the drug's mechanism of action most likely to be beneficial for this patient?

## Choices:

1. Glucose-dependent insulin secretion
2. Glucagon-dependent insulin secretion
3. Decreasing insulin resistance
4. Reducing intestinal glucose absorption

## Answer: 1 - Glucose-dependent insulin secretion

## Explanations:

- Glucagon-like peptide 1 (GLP-1) is considered an incretin and is one of a family of naturally occurring gut hormones that are released in the setting of a meal, but not with intravenous carbohydrate.
- DPP-4 is a ubiquitous enzyme that deactivates GLP-1; therefore, its inhibition could potentially affect glucose regulation through multiple effects.
- GLP-1 exerts its main effect by stimulating glucose-dependent insulin release from the pancreatic islets.
- Alpha-glucosidase inhibitors like acarbose reduce intestinal glucose absorption.

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## Research Concepts:

### Alogliptin

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## Question 490:

A 45-year-old male patient presents to the clinic with a hemoglobin A1c of 8.4%. His current medical regime includes metformin 1000 mg twice daily, glipizide 5 mg once daily, and insulin glargine 30 units nightly. His glucose concentration is well-controlled, but he cannot seem to maintain an adequate HbA1c. What would be the next best step in therapy to achieve the most significant response?

## Choices:

1. A once-weekly GLP-1 agonist
2. A daily GLP-1 agonist
3. Twice daily exenatide
4. Exenatide

## Answer: 1 - A once-weekly GLP-1 agonist

## Explanations:

- Studies have demonstrated a better response with once-weekly Exenatide than twice-daily exenatide injections.
- Once weekly exenatide, it would lessen the burden on the patient and potentially increase medication compliance.
- The American Diabetes Association suggests adding a GLP-1 agonist if a patient is currently using basal insulin with glucose concentrations at goal, but still has not achieved A1c goals.
- The use of GLP-1 receptor agonists has a lower risk of causing hypoglycemia than mealtime insulin.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Exenatide

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## Question 491:

A 74-year-old man is admitted to the hospital due to dialysis-related septicemia. Upon systems review, it is also discovered that he has high calcium and parathyroid hormone levels. Treatment with the most appropriate medication for his calcium-related complication is initiated. Which of the following side effects is most likely to occur with this medication?

## Choices:

1. Urinary retention
2. Urinary incontinence
3. Increased appetite
4. Arrhythmia

## Answer: 4 - Arrhythmia

## Explanations:

- Cinacalcet is indicated for hyperparathyroidism secondary to chronic kidney disease, or in calciphylaxis.
- Lowering calcium levels is the therapeutic effect, but it can also cause hypocalcemia.
- Hypocalcemia manifests itself as seizures, muscle cramps, facial twitching, nausea, vomiting, or a prolonged QT interval.
- Prolonged QT interval can lead to arrhythmias.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Cinacalcet

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## Question 492:

Parents bring their 6-year-old male child to the clinic, reporting that he sleeps all the time, has an increased appetite, and has frequent genital fondling. Exam findings include descended testes bilaterally, thinned scrotum, pubic hair, and phallic deviation, tanner stage 4. He is started on GnRH analog therapy. What are the expected values of LH and FSH after initial treatment with the drug?

## Choices:

1. LH increased, FSH decreased
2. LH increased, FSH increased
3. LH decreased, FSH increased
4. LH decreased, FSH decreased

## Answer: 2 - LH increased, FSH increased

## Explanations:

- The young male presents with secondary sexual characteristics and findings suggestive of central precocious puberty such as increased sleep, fatigue and increased appetite pointing to hypothalamic dysfunction.
- The first-line treatment for central precocious puberty is leuprolide, a GnRH analog.
- Leuprolide causes an initial rise in LH and FSH and only with continuous use does it cause these levels to drop over time.
- LH and FSH are both going to increase in this case since the stimulation of the GnRH receptor will act on the increased release of both hormones. So the values of both LH and FSH would change in the same way with the use of leuprolide.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Leuprolide

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## Question 493: A 50-year-old man presents to the clinician with a history of loss of libido and milky white discharge from both the nipples. He also states he has headaches and blurring of the peripheral vision for the last two months. MRI of the brain reveals a mass found in the anterior pituitary. Which symptom is most likely to occur in this man?

## Choices:

1. Gynecomastia
2. Headache
3. Azoospermia
4. Priapism

## Answer: 2 - Headache

## Explanations:

- The patient most likely has pituitary adenoma, which is prolactinoma. Unlike women, men tend to present with either a headache or visual changes in the presence of a prolactinoma. They also present with decreased libido, impotence, erectile dysfunction, oligozoospermia (due to secondary hypogonadism).
- Prolactin-secreting tumors of the pituitary gland are called prolactinomas. It is the most common secretory tumor of the pituitary gland accounting for up to 40% of total pituitary adenomas. Prolactinomas cause a wide variety of symptoms either due to the mass effect of the tumor or due to hypersecretion of prolactin. Prolactin prevents the secretion of GnRH secretion.
- Prolactinomas clinically present because of the mass effect of the tumor or because of hyperprolactinemia. Microprolactinomas (less than 1 cm) can present with symptoms of hyperprolactinemia or are detected incidentally on neuroimaging done for other reasons. Macroprolactinomas, on the other hand, present with mass effects on the surrounding structures.
- Prolactin levels should be checked in all men with confirmed hypogonadism and as part of the routine evaluation of male infertility. Prolactinoma causes oligozoospermia, not azoospermia. Gynecomastia and priapism are also not noted.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Prolactinoma

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## Question 494: A 42-year-old male presents to the clinician to establish care. He mentions that he had a Roux-en-Y gastric bypass procedure performed two years ago and has been satisfied with the results of the procedure so far. The surgeon recommended that he take calcium supplementation, although the patient cannot remember the exact dose to take. Which of the following options would allow for optimal calcium absorption in this patient?

## Choices:

1. Calcium citrate 600 mg, taken twice daily
2. Calcium citrate 1200 mg, taken once daily
3. Calcium carbonate 600 mg, taken twice daily
4. Calcium carbonate 1200 mg, taken once daily

## Answer: 1 - Calcium citrate 600 mg, taken twice daily

## Explanations:

- The Roux-en-Y bypass procedure can affect calcium absorption in several ways. Firstly, the gastric bypass decreases the overall exposure to acidity, which is essential for calcium absorption. Additionally, the bypass of the duodenum reduces calcium absorption because many of the calcium transporters are located in the duodenum.
- Calcium citrate is less dependent on stomach acid for absorption relative to calcium carbonate. Therefore, calcium citrate will have greater absorption in patients who have had a gastric bypass.
- Calcium citrate has a significantly higher bioavailability than calcium carbonate. This is independent of the effects of absorption at different pH levels.
- Patients with altered gastrointestinal physiology (e.g., bariatric surgery, inflammatory bowel disease, celiac disease, etc.) should be considered high-risk for malnutrition and vitamin and mineral deficiencies. Supplementation with various vitamins and minerals may be necessary. Consultation of specialists is highly recommended for these high-risk patients.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Dietary Calcium

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## Question 495:

A 36-year-old man presents to the clinic with a visible swelling on the left side of the neck and pain during deglutition. Thyroid function tests are within normal limits. Ultrasound reveals an isoechoic, solid nodule measuring 3.8 x 2.4 cm in the lower pole of the left lobe of the thyroid. Fine-needle aspiration is suggestive of a follicular adenoma. Which of the following is the next best step in the management of this patient?

## Choices:

1. Carbimazole
2. Radioactive iodine therapy (RIT)
3. Left thyroid lobectomy and isthmusectomy
4. Total thyroidectomy

## Answer: 3 - Left thyroid lobectomy and isthmusectomy

## Explanations:

- Thyroid lobectomy and isthmusectomy is an option for patients with a benign follicular adenoma, especially for patients having symptoms from the adenoma.
- Follicular adenomas are clinically silent, solitary and range in diameter from 3 cm on average.
- Also called "cold nodules," they do not produce excess thyroid hormone.
- The patient is euthyroid as no abnormal findings were detected on thyroid function tests. Hence, there is no need for antithyroid medications. Radioactive iodine therapy (RIT) is a tool in the management of hyperthyroidism and differentiated thyroid cancer. Total thyroidectomy is necessary only for invasive follicular carcinoma.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Thyroid Adenoma

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## Question 496: In doing a thyroid uptake, why take the 6-hour value when there is going to be a 24-hour value?

## Choices:

1. The patient may not show up the next day
2. If there is very rapid turnover, as in severe Graves disease, the 24-hour uptake may be in normal range, but the 6-hour uptake will be elevated
3. So the patient does not have to fast the entire 24 hours
4. It is a simple recheck, to avoid calculation error

## Answer: 2 - If there is very rapid turnover, as in severe Graves disease, the 24-hour uptake may be in normal range, but the 6-hour uptake will be elevated

## Explanations:

- While it is a concern that the patient may not return, it is not the main reason.
- Fasting during a radioiodine uptake study is not necessary.
- Even if both 6- and 24-hour uptakes are correctly calculated, they are not typically expected to be the same, so one cannot be checked against the other.
- In addition, the risk of making a calculation error doubles by doing two calculations.

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## Research Concepts:

### Thyroid Uptake and Scan

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## Question 497:

A 38-year-old male patient presents to the hospital for the evaluation of facial changes described as “wrinkles,” which have been worsening for many years. Over the holidays, his family, that he had not seen in many years, noted they no longer recognized him. He is a smoker, and a recent chest X-ray was negative for any suspicious lesions. His exam is unremarkable except for coarsening facial features most prominent over his forehead, and he has marked clubbing of all his fingers. Hypertrophic osteoarthropathy is suspected, but before this diagnosis can be confirmed, which of the following tests should be ordered to rule out a condition with identical skin changes?

## Choices:

1. Skin biopsy
2. Prostate-specific antigen
3. Insulin-like growth factor-1
4. ANA

## Answer: 3 - Insulin-like growth factor-1

## Explanations:

- This patient is presenting with cutis verticis gyrata, an extreme dermatologic manifestation of hypertrophic osteoarthropathy. Clubbing and protuberant skin changes are the most common findings in primary hypertrophic osteoarthropathy (pachydermoperiostosis).
- Acromegaly may present with protuberant skin changes and digital clubbing as well. Therefore an IGF-1 level is an appropriate screen to rule out acromegaly in this patient.
- There is no association between prostatic dysfunction or malignancy and hypertrophic osteoarthropathy.
- A skin biopsy would not help differentiate hypertrophic osteoarthropathy (HOA) from other conditions. Skin biopsy is not routinely done in the assessment of HOA. An ANA would be an appropriate screening test if SLE were suspected. Acromegaly is most likely to present identically to hypertrophic osteoarthropathy.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hypertrophic Osteoarthropathy

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## Question 498:

A 33-year-old male worker of a caustic soda manufacturing factory presents to the clinic with complaints of fatigue, insomnia, impaired concentration, and headaches. The headaches often occur with sweating, tremors, and palpitations and force him to rest while at work. His past medical history is unremarkable. He does not smoke, use alcohol, or illicit drugs. His blood pressure is 160/110 mmHg and, several repeat measurements are all elevated. A fourth heart sound is audible. The neurological evaluation confirms poor recall, symmetrical coarse tremors of the hands, and no other deficits. An itchy skin rash in the hands and feet is present. The laboratory examination reveals a creatinine of 2.0 mg/dL. There is an elevation of serum catecholamines and urinary normetanephrine. An MRI of the adrenals and sympathetic chain is normal. Which of the following substances is most likely responsible for this patient's condition?

## Choices:

1. Arsenic
2. Mercury
3. Vanadium
4. Cadmium

## Answer: 2 - Mercury

## Explanations:

- The clinical picture of hypertension with headaches, palpitations, and sweating is suggestive of pheochromocytoma. A negative MRI should raise suspicion of another etiology of catecholamine excess. This patient's additional features like memory deficits, tremors, skin rash, and nephropathy, are added clues to another etiology.
- This patient works in a caustic-soda manufacturing plant where he is at risk for mercury exposure. It may present with several of the features seen in this patient. Some other situations at-risk for mercury toxicity include wood preservation, precious metal extraction, pharmaceutical preservation, and manufacturing of switches and thermostats.
- Mercury inactivates the co-factor S-adenosyl methionine of the enzyme catechol-o-methyl transferase (COMT). This enzyme metabolizes catecholamines to inactive metabolites.
- A non-functional enzyme will cause the accumulation of catecholamines and the clinical effects seen in this patient. Unexplained hypertension with features of pheochromocytoma in the clinical context of heavy metal toxicity should raise suspicion of mercury toxicity.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Heavy Metal Toxicity

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## Question 499:

A 58-year-old woman with a past medical history of follicular thyroid cancer diagnosed 3 years ago status post total thyroidectomy and radioactive iodine treatment presents for her annual follow-up appointment. She has no complaints, and there are no significant findings on the physical exam. Her thyroglobulin level is 36 ng/mL, which is elevated from 2.0 ng/mL (normal range: 1.5-38.5 ng/mL in non-thyroidectomized patient) a year ago. Neck ultrasound does not show any suspicious lymph node or recurrence in the thyroid bed. Which of the following is the next best step in the management of this patient?

## Choices:

1. CT neck
2. Thyrotropin-alfa stimulated I-131 whole body scan
3. FDG-PET scan
4. Reassurance

## Answer: 2 - Thyrotropin-alfa stimulated I-131 whole body scan

## Explanations:

- The patient has biochemical evidence of recurrent and/or metastatic thyroid cancer. Generally, the first study is a neck ultrasound and then proceed with further imaging with radioactive iodine scan to identify local and/or distant metastasis.
- The next step should be ordering a diagnostic I-131 whole body scan to identify radio-avid metastatic lesions. This can be done with either thyroid hormone withdrawal or with thyrotropin-alfa. Computed tomography of the neck might be performed if any suspicious lesions on the neck ultrasound or in the whole body radioactive study.
- If I-131whole body scan does not reveal any uptake, the next step could be FDG-PET/CT and or MRI/CT scan.
- Because serum thyroglobulin has significantly increased, further studies are needed.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Iodine-131 Uptake Study

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## Question 500: A 34-year-old woman presents to the clinic with a chief complaint of redness of the skin with burning and itching sensation. The patient has a history of diabetes mellitus type 2, hypertension, obesity, and hypertriglyceridemia. The patient takes niacin 250 mg daily, losartan 25 mg daily, metformin 500 mg twice daily. Which of the following is the most appropriate recommendation for this patient?

## Choices:

1. Take niacin in between the meals
2. Take niacin in the morning
3. Take hot coffee with niacin
4. Take aspirin 325 mg 30 minutes before niacin

## Answer: 4 - Take aspirin 325 mg 30 minutes before niacin

## Explanations:

- The patient's symptoms of redness of skin with burning and itching sensation refer to flushing due to niacin.
- Flushing is a side effect of niacin and is usually a benign condition but is uncomfortable.
- The symptoms can be decreased by the administration of aspirin 30 minutes before the niacin dose.
- Taking the aspirin at bedtime, with the meals, and avoiding hot beverages for other potential strategies to prevent flushing due to niacin.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hypertriglyceridemia

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## Section 6

Question 501: A 35-year-old male presents with loss of libido and erectile dysfunction which began about 4 months prior. He has also been experiencing headaches that occur spontaneously throughout the day and believes the pain is causing him to "run into things" such as furniture and doors. Confrontation fields reveal a loss of temporal vision in both eyes. What structure is most likely damaged?

### Choices:

1. Optic nerve
2. Optic chiasm
3. Optic tract
4. Meyer's loop

## Answer: 2 - Optic chiasm

## Explanations:

- Patients with lesions to the optic chiasm may present with bitemporal hemianopia and depth perception disturbances.
- An intact optic chiasm allows each cerebral hemisphere to receive, process, and superimpose visual information from the contralateral visual field of both eyes. This generates stereoscopic vision or the perception of depth.
- Pituitary tumors, such as prolactinomas, are capable of compressing the decussating fibers at the optic chiasm.
- The decussating fibers originate from the nasal retina, relaying visual information from the temporal visual field of the corresponding eye.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Neuroanatomy, Optic Chiasm

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## Question 502:

A 17-year-old female is brought to the emergency department (ED). She has diabetes mellitus type 1 and has had four previous presentations with diabetic ketoacidosis due to poor medication compliance. Her Glasgow coma scale is 13, and she is unable to give a reliable history. She was brought to the ED by her partner, who stated that she has been fully compliant with her insulin regimen. She had been in good health recently other than a bladder infection last week that was treated with a few days of oral antibiotics. On examination, she is febrile at 39 C (102.2 F), her pulse is 110 bpm, and she is hypotensive with a systolic blood pressure of 90 mmHg. Her chest is clear on auscultation. Her abdomen is soft and does not have any physical signs suggesting peritonitis. There were no obvious soft tissue or joint inflammations. Her arterial blood gas shows a pH of 7.25 and the rest of her blood panel is still pending. A Foley catheter is placed. Her urine dipstick is positive for glucose and ketones, slightly positive for leukocytes and nitrites. Other than fluids and insulin, which of the following is the next best step in management?

## Choices:

1. Sodium bicarbonate IV
2. Ceftriaxone IV
3. Lumbar puncture
4. Steroids IV

## Answer: 2 - Ceftriaxone IV

## Explanations:

- The patient has presented with diabetic ketoacidosis. DKA is a medical emergency, and one can usually identify a precipitant. In a patient with an established diagnosis of type 1 diabetes with good insulin compliance, the usual triggers are sepsis, ischemic events such as a myocardial infarction, stroke, or drug side effects. While this patient has had previous DKA episodes due to non-compliance, it is prudent to consider an alternative precipitant in the presence of reported insulin compliance at present. The most likely trigger in this patient is sepsis. While her clinical observations might be due to DKA, she may also be in septic shock. This is a medical emergency and needs aggressive treatment as early as possible. Often, these patients are treated empirically while waiting for confirmatory tests. Sodium bicarbonate is a controversial intervention in metabolic acidosis and is generally not used unless the patient is profoundly acidotic (pH less than 7.1). It is not the most appropriate next step in the management of this patient.
- Empiric antibiotics are appropriate after fluids and insulin. Considering a recent infective source in a patient with diabetes, one can presume that it is a partially treated urinary tract infection (UTI), hence the negative urine dipstick. Ceftriaxone would provide good cover as an empiric first-line agent for a complicated UTI, as well as undifferentiated sepsis. Steroids are not routinely used in sepsis although there may be some benefit in selected cases that are otherwise unresponsive.
- A lumbar puncture might be appropriate if there were other clues to suggest meningitis. There is no mention of preceding meningitis features or meningism on examination. There is a good alternative source of sepsis (UTI). Ceftriaxone is an appropriate first-line agent for meningitis. Using antibiotics before obtaining a good CSF sample might reduce the yield of any subsequent lumbar puncture. However, antibiotics must not be delayed in a medical emergency such as this case.
- An indwelling catheter is going to be quite useful for accurate intake/output monitoring in this case and will provide a high-quality urine sample for testing and culture. But it should not delay antibiotics. Antibiotics will be life-preserving, and cannot be substituted by any intervention in septic shock.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Complicated Urinary Tract Infections

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report any questions that need improvement.

## Question 503: A 17-year-old woman complains of irregular menses and excessive facial hair. She is obese and reports her mother had similar symptoms. Laboratories show normal estrogen levels, increased luteinizing hormone, low follicle-stimulating hormone, elevated testosterone level, and elevated urinary 17-ketosteroids. What is the most likely diagnosis?

## Choices:

1. Polycystic ovary syndrome
2. Cushing disease
3. Adrenal adenoma
4. Addison syndrome

## Answer: 1 - Polycystic ovary syndrome

## Explanations:

- Polycystic ovary syndrome or Stein-Leventhal syndrome is characterized by cystic ovaries, amenorrhea, obesity, and hirsutism.
- Patients may have abnormal irregular menses, primary amenorrhea, or normal menses.
- Estrogen levels can be normal or increased, luteinizing hormone is increased, follicle-stimulating hormone can be normal or decreased, and testosterone can be normal or increased.
- Treatment can include progesterone, metformin, antiandrogens with oral contraceptives, or spironolactone.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Polycystic Ovarian Disease

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## Question 504:

A 33-year-old male presents to the office for routine follow-up. He was diagnosed with pseudohypoparathyroidism 3 years ago he developed a seizure disorder. Three weeks ago he ran out of medications, and just this week he experienced his first seizure in over 6 months. On physical exam he has shortened fourth and fifth metatarsals, he is obese with a short neck and short stature. Which of the following additional findings would likely be present in his initial physical exam?

## Choices:

1. Absence of constriction of the contralateral pupil with bright light shown into the ipsilateral pupil
2. Reflex extension of hips and knees with passive flexion of the neck
3. Carpopedal spasm after blood pressure cuff is placed around the proximal arm and inflated to greater than systolic blood pressure for 3 minutes
4. Upward movement of the big toe with stroking the lateral plantar aspect of the foot from the heel toward the toe

## Answer: 3 - Carpopedal spasm after blood pressure cuff is placed around the proximal arm and inflated to greater than systolic blood pressure for 3 minutes

## Explanations:

- Trousseau's sign is positive when carpal pedal spasm with flexion of the wrist and metacarpophalangeal joint and extension of distal interphalangeal joint and proximal interphalangeal joint presents after blood pressure cuff is placed around the proximal arm and inflated to greater than systolic blood pressure for 3 minutes. This physical exam maneuver is much more sensitive than Chvostek's sign, however more cumbersome to perform.
- Pseudohypoparathyroidism manifests as hypocalcemia, hyperphosphatemia and elevated PTH level. Symptomatic hypocalcemia can cause seizures and on physical exam, Trousseu's and Chvostek's signs can be positive.
- Patients with pseudohypoparathyroidism frequently require calcium and vitamin D supplementation to avoid symptomatic hypocalcemia. Stopping these supplements can lead to perioral numbness, muscle cramping, and in more severe cases seizures.
- Another important finding in hypocalcemia is a prolongation of QT interval on EKG.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Pseudohypoparathyroidism

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## Question 505:

A 60-year-old woman is being evaluated for hypoglycemia. She reports episodes of palpitations, tremors, and sweating typically occurring in her sleep for over a year. Her glucose during these episodes is consistently lower than 40 mg/dL. Typically these symptoms resolve after she has some orange juice. She does not have a history of diabetes mellitus and is not taking any insulin or sulfonylureas. Further laboratory assessment during an episode of hypoglycemia (glucose 45 mg/dL) is shown below.

| | Patient value | Expected values for current glucose level |
|---|---|---|
| Plasma insulin | 6 microU/mL | 3 microU/mL |
| Beta-hydroxybutyrate | 2 mmol/L | >2.7 mmol/L |
| C-peptide | 4 mmol/L | 0.2 mmol/L |

CT scan shows a small lesion in the head of the pancreas. Which of the following is the next best step in the management of this patient?

## Choices:

1. Endoscopic ultrasound
2. 68Ga-DOTATATE-PET scan
3. MRI abdomen
4. Continuous glucose monitoring

## Answer: 2 - 68Ga-DOTATATE-PET scan

## Explanations:

- Insulinomas are pancreatic neuroendocrine tumors that secrete insulin and can cause hypoglycemia. It is characterized by a high level of insulin and high levels of C-peptide and beta-hydroxybutyrate in the presence of hypoglycemia.
- 68Ga-DOTATATE scans are useful in the initial diagnosis and recurrence of neuroendocrine tumors.
- About 20% of neuroendocrine tumors are metastatic on presentation; therefore, a 68Ga-DOTATATE scan can be helpful in the initial staging of neuroendocrine tumors.
- Short and long-acting somatostatin analogs should be stopped a day and 3-4 weeks respectively before the DOTATATE scan.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Nuclear Medicine Endocrine Assessment, Protocols, And Interpretation

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## Question 506:

A 57-year-old male comes to the office for follow-up with a history of end-stage renal disease on dialysis due to hypertension. He denies any acute complaints. Current medications include sevelamer and paricalcitol. Vital signs are stable and physical examination is remarkable only for a left upper extremity fistula with an audible bruit and thrill. Labs demonstrate PTH levels of 780 pg/mL, calcium 10.9 mg/dL, and phosphorous 4.7 mg/dL. Which is the most appropriate treatment for his secondary hyperparathyroidism?

## Choices:

1. Cinacalcet
2. Surgery
3. Bisphosphonates
4. Estrogens

## Answer: 1 - Cinacalcet

## Explanations:

- Cinacalcet is approved for secondary hyperparathyroidism (elevated parathyroid hormone levels), a consequence of end-stage renal disease. It is often used in conjunction with a phosphate binder (such as Sevelamer) and Vitamin D analog (paricalcitol) to reduce calcium levels and decrease PTH levels. It is indicated in this patient as the PTH is still extremely elevated despite the use of a phosphate binder and vitamin d analog.
- Hypocalcemia (decreased calcium levels) is a contraindication for cinacalcet. Patients who have serum calcium levels less than 8.0 mg/dL should not be started on cinacalcet.
- Hypocalcemia symptoms include paresthesias, myalgias, muscle cramping, tetany, and convulsions in severe hypocalcemia.
- Cinacalcet should not be administered until serum calcium levels are above 8.0 mg/dL, and hypocalcemia symptoms are resolved.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Cinacalcet

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## Question 507:

A 31-year-old woman complains of tingling and numbness in her lower limbs that started three months ago and is progressively getting worse. She also complains of fatigue and irregular menses. Her last menstrual period was two months ago. She denies weight loss, visual changes, headaches, or constipation. Her past medical history is significant for Hashimoto thyroiditis since she was 21-years-old for which she is taking levothyroxine. Her mother also has hypothyroidism. Blood pressure is 110/81 mm Hg, and pulse is 70 beats/min. On examination, her thyroid is nonpalpable. She has no scleral icterus, and her mucous membranes are moist. There is decreased vibration and proprioception in both of her lower limbs. Her ankle jerk reflexes are absent, and other reflexes are brisk. There is a positive Babinski and Romberg sign. Laboratory tests show hemoglobin of 8 g/dL, hematocrit of 22 %, white blood cell count of 3,200/mm3, platelet count of 300,000/mm3, total T4 8.2 mcg/dL, and thyroid-stimulating hormone of 2.4 micro UI/mL. What is the next best step in the management of this patient?

## Choices:

1. Measure serum vitamin B12 levels
2. Measure serum folate levels
3. Increase her levothyroxine dose
4. Measure serum T3 levels

## Answer: 1 - Measure serum vitamin B12 levels

## Explanations:

- Patients with Hashimoto thyroiditis have an increased risk of developing other autoimmune disorders, such as pernicious anemia.
- Pernicious anemia is the autoimmune destruction of parietal cells of the stomach leading to achlorhydria and decreased production of intrinsic factor. Intrinsic factor binds dietary vitamin B12 and aids in its absorption in the distal ileum.
- The lack of intrinsic factor leads to a decrease in the absorption of dietary vitamin B12, which causes vitamin B12 deficiency. Vitamin B12 deficiency is manifested by macrocytic anemia due to defective nucleic acid synthesis, and subacute combined degeneration, which is the degeneration of the posterior and lateral spinal columns leading to ataxia, loss of proprioception and vibratory sensations.
- This patient with a history of Hashimoto thyroiditis and signs and symptoms of pernicious anemia should get her serum vitamin B12 levels checked.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Pernicious Anemia

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## Question 508: A 16-year-old boy presents to his primary provider for a well-child check. His height is at 80th percentile, weight at 50th percentile, and mid-parental target height is 50th percentile. He has always had some difficulty with verbal processing and language delay but is in mainstream classes at school. He has a fine intention tremor. On pubertal exam, he has Tanner IV pubic hair and 4 mL testes bilaterally. Why do patients with these findings need to be followed for many years?

## Choices:

1. They may develop schizophrenia
2. Risk of breast cancer
3. Risk of endocarditis
4. Risk of peripheral vascular disease

## Answer: 2 - Risk of breast cancer

## Explanations:

- Patients with Klinefelter syndrome are at an increased risk for germ cell tumors and breast cancer.
- The risk of breast cancer is 20 times that of healthy males.
- Other cancers also common in Klinefelter include leukemias, lymphomas, and gonadal tumors.
- Non-cancerous conditions include osteoporosis and deep vein thrombosis.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Klinefelter Syndrome

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## Question 509:

A 65-year-old woman with a medical history significant for coronary artery disease, type 2 diabetes mellitus, hypertension, and a previous myocardial infarction (MI) 4 years ago presents to the emergency department complaining of substernal chest heaviness. The pain radiates down her left arm and occurred while watching TV. It is associated with shortness of breath, diaphoresis, and nausea. The pain is similar to what she experienced with her previous MI. An EKG reveals new inversions of the T waves in the inferior leads. Her initial troponin is elevated at 1.1 ng/mL. The patient is admitted to the hospital under chest pain protocols, and she is started on a heparin drip. The patient undergoes a left heart catheterization, which reveals severe disease of the proximal left main artery, the left circumflex artery, and the right coronary artery. A plasma volume study is planned. Which of the following factors is most appropriate to standardize patient volumes for this study?

## Choices:

1. BMI
2. Ideal body weight
3. Total body weight
4. Body composition

## Answer: 4 - Body composition

## Explanations:

- Patients' body weight varies with body composition (lean body mass vs. fat).
- Patients with higher body fat actually have a blood volume that is lower per unit of mass, and similarly, patients with more lean body mass have a higher blood volume per unit of mass.
- Because of this, the volume will vary from lean body mass to fat, and volume status is therefore standardized by body composition.
- A method to do this is by using the "Metropolitan Life Height and Weight Tables."

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Plasma Volume Study

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## Question 510: What malignancies to a majority of patients with Cowden disease go on to develop?

## Choices:

1. Spine, ribs, and pelvis
2. Skin, eyes, and brain
3. Thyroid, endometrium, and breast
4. Leukemia, lymphoma, and soft tissue

## Answer: 3 - Thyroid, endometrium, and breast

## Explanations:

- Uterine leiomyomas and ovarian cysts can occur in females and may produce menstrual abnormalities along with a possible 20% to 30% increased risk of endometrial carcinoma.
- Females with Cowden disease are also at a much higher risk of breast carcinoma, with about 85% of females with Cowden syndrome developing breast carcinoma at some time in their life. Interestingly, breast carcinoma has also been reported in men. Benign fibrocystic disease and fibroadenomas are also commonly seen in females.
- The majority of patients affected with the disease go on to develop a malignant neoplasm of the thyroid, endometrium, or breast. Thyroid abnormalities such as goiter, thyroglossal duct cysts, and adenomas are also commonly seen. Thyroid carcinoma risk is also increased by up to 30%.
- More than 85% of patients may have gastrointestinal involvement with hamartomatous polyps. The risk of colon cancer in patients is slightly elevated.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Cowden Disease

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## Question 511:

A 57-year-old man with a history of chronic obstructive pulmonary disease, former intravenous drug use, insulin-dependent diabetes, chronic kidney disease on dialysis, and polyneuropathy presents to the emergency department with progressively worsening bilateral lower extremity edema. His vital signs reveal temperature 39 C, blood pressure 90/67 mmHg, heart rate 110/min, respiratory rate 22/min, and SpO2 95% on room air. He appears to be in acute distress. His exam is notable for dry oral mucosa, flat neck veins, clear lung sounds, normal heart sounds, and lower extremity erythema that is warm to touch and exquisitely painful. Multiple attempts at obtaining intravenous access are made by nursing, but due to poor access, peripheral intravenous line insertion fails. A central venous catheter is emergently placed in the internal jugular vein. The patient is given normal saline, broad-spectrum antibiotics, and norepinephrine. The basic metabolic panel results show sodium 156 mg/dL, chloride 126 mmol/L, potassium 3.0 mEq/L, bicarbonate 12 mEq/L, BUN 30 mg/dL, creatinine1.2 mg/dL and glucose 62 mg/dL. The finger-stick blood sugar at triage five minutes prior to the initial evaluation was 220 mg/dL. What is the most likely cause of the patient's electrolyte abnormalities?

## Choices:

1. Severe anion gap metabolic acidosis
2. Inappropriate lab draw
3. Mixed acid-base disorder
4. Adrenal insufficiency

## Answer: 2 - Inappropriate lab draw

## Explanations:

- The electrolyte derangement does not fit with the clinical picture. This is the most likely explanation. The first 4 to 5 mL of blood should be discarded when withdrawing blood for blood tests from a central venous catheter.
- While the labwork dose supports an anion gap metabolic acidosis (gap 18), the sodium and chloride are excessively high. In addition, the creatinine is low, which is unlikely in a patient with chronic kidney disease who is on dialysis. The dilution of glucose is also a strong hint that this is unlikely to be due to sepsis.
- The most likely explanation was that an inadequate amount of fluid was withdrawn and discarded from the side port prior to drawing labwork. In this case, the emergent need for blood pressure support trumped the need to obtain labs.
- The elevated sodium and chloride, with concomitant decreases in the remainder of the electrolyte panel, are unlikely to be due to sepsis. More likely, an inappropriate amount of fluid was withdrawn and discarded prior to drawing the lab work. Adrenal insufficiency would be expected to cause low sodium and elevated potassium. The electrolyte derangements are unlikely to be due to adrenal insufficiency and are more likely due to an insufficient quantity of discarded fluid from the indwelling catheter.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Central Venous Catheter

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## Question 512:

A 42-year-old female presented to the emergency department after the acute onset of right flank pain, which started suddenly 1 hour ago, the patient is nauseated and vomiting. The pain is radiating to the right groin. She is previously healthy, and she does not smoke or drinks alcohol. She is afebrile, blood pressure 120/78 mm Hg, heart rate 78 beats/min regular, saturation is 98% on ambient air. On examination, no pain on costovertebral percussion, no abdominal distension, or guarding. Chest and heart auscultation is clear with no murmurs. Her labs shows calcium level of 12,4 mg\dL, albumin is 4.1 g\dL, her parathyroid hormone level is 112 pg/mL ,the phosphate is 2.0 mg\dL, creatinine 0.9 mg/dL, the calcium:creatinine ratio is 0.28, and 25 hydroxyvitamin D level is 30 ng/mL. Her abdominal CT scan shows a 0.8 mm stone in the mid-right ureter. Regarding the long-management plan of her most likely diagnosis, Which of the following is the best option if the patient refuses surgery?

## Choices:

1. Denosumab
2. Teriparatide
3. Cinacalcet
4. Furosemide

## Answer: 3 - Cinacalcet

## Explanations:

- Primary hyperparathyroidism has high parathyroid hormone leading to hypercalcemia, hypophosphatemia. Parathyroid hormone (PTH) levels are high in patients with primary hyperparathyroidism. Regarding this patient lab, which shows hypercalcemia, hypercalciuria, and hypophosphatemia in the presence of high PTH level, normal 25-hydroxy vitamin D and normal creatinine are all indicative of hyperparathyroidism.
- The current guidelines state that surgery should be recommended for asymptomatic primary hyperparathyroidism when: Serum calcium is more than 1 mg/dL greater than the upper limit of normal, Age younger than 50 years, Osteoporosis, GFR less than 60 mL/min, Urine calcium greater than 400 mg/24 hours, Evidence of renal calcification or stones. When the patient refuses surgery or is not a candidate for surgical intervention, medical therapy becomes the first line of long-term treatment. Cinacalcet and bisphosphonate are both used to treat primary hyperparathyroidism when surgery is not an option.
- Agonists to the calcium-sensing receptor, such as cinacalcet will lower PTH and calcium levels. However, they do not increase bone density. On the other hand, bisphosphonates can increase bone mineral density in those with osteoporosis or osteopenia and can be used in a patient with primary hyperparathyroidism.
- Corrected calcium = measured calcium + 0.8 x (4.0 - albumin) should always be measured to estimate the level of hypercalcemia. Teriparatide is a parathyroid hormone which represents the bioactive portion of the hormone. It is used in some patients with osteoporosis, not in primary hyperparathyroidism.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Primary Hyperparathyroidism

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## Question 513: A patient presents with heart palpitations, anxiety, and increased appetite. She also says that she has lost weight. MRI reveals a 12 mm pituitary tumor. Which of the following is the most likely thyroid function test profile?

## Choices:

1. Undetectable thyroid stimulating hormone (TSH) and increased T4
2. Increased TSH, increased alpha subunit, and increase T4
3. Low T4 and increased TSH
4. Increased TSH with low T3

## Answer: 2 - Increased TSH, increased alpha subunit, and increase T4

## Explanations:

- Hyperthyroidism with a pituitary tumor is indicative of increased TSH.
- TSH is secreted by the anterior pituitary, which stimulates the thyroid gland to increase T4 secretion.
- The alpha subunit is a component of TSH structure and would, therefore, be expected to increase with an increase in TSH.
- A patient with pituitary tumor secreting excessive TSH can present with bitemporal hemianopia and symptoms of hyperthyroidism such as weight loss, heat intolerance, and irritability.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hyperthyroidism

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## Question 514:

A 65-year-old morbidly obese male with a past medical history of hypothyroidism has a 2-month history of frequent urination, fatigue, and 4 pound (1.8 kg) weight loss. He takes levothyroxine for his thyroid problem and his previous TSH levels 2 weeks prior were within normal limits. The patient admits to poor dietary habits, often eating store-bought meals, sodas, and take-out food. He works as a truck driver and endorses a sedentary lifestyle. His mother and sister both have a diagnosis of Type 2 Diabetes. On physical exam, he has a BMI of 42, but his vitals are normal. On cardiovascular auscultation, he has a regular rate and rhythm without murmurs. He has 2+ patellar reflex and 1+ Achilles reflex. He has mildly decreased sensation to light touch on the soles of his feet bilaterally. Which of the following is the most diagnostic renal lesion in this patient?

## Choices:

1. Diffuse glomerulosclerosis
2. Nodular glomerulosclerosis
3. Arteriosclerosis
4. Necrotizing papillitis

## Answer: 2 - Nodular glomerulosclerosis

## Explanations:

- Nodular glomerulosclerosis is widely held to be pathognomonic of diabetes mellitus.
- Other glomerular lesions include diffuse glomerulosclerosis and exudative lesions.
- The interstitium may show pyelonephritis and hyaline arteriosclerosis may be present.
- Globally, over 400 million adults are living with diabetes mellitus.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Diabetes Mellitus

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## Question 515:

A 40-year-old man presents for a follow-up for his diabetes mellitus. He was diagnosed with diabetes mellitus type 2 three years ago. He reports compliance with medical therapy and has good glycemic control. Recent laboratory records revealed normal kidney function. He has no other medical history. Physical exam and vital signs are unremarkable. What should be the hemoglobin A1c goal for this patient?

## Choices:

1. Less than 6.5%
2. Less than 8%
3. Between 7% to 8%
4. Between 7% to 8.5%

## Answer: 1 - Less than 6.5%

## Explanations:

- The American Association of Clinical Endocrinologists (AACE) has a suggested target hemoglobin A1c of less than 6.5% for patients with type 2 diabetes and no other comorbid conditions.
- The AACE and the American Diabetes Association (ADA) have different targets for A1c goals and diabetes management.
- The recommended goal by the ADA for A1c in this patient would be less than 7%.
- Lenient control up to 8.5% is recommended for the elderly population at higher risk of complications due to hypoglycemia.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hemoglobin A1C

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## Question 516: A 32-year-old woman is seen in follow-up to her weight loss and amenorrhea. Labwork from 6 weeks ago showed a thyroid-stimulating hormone (TSH) level of 0.3 microU/mL and a free thyroxine (T4) level of 4.2 ng/dL. She was prescribed methimazole and is tolerating it well. She reports the return of her menstrual periods and wanted to discuss family planning during today's visit. Which of the following is the most appropriate recommendation for this patient?

## Choices:

1. Continue methimazole for all three trimesters of pregnancy
2. Stop methimazole, and continue with propylthiouracil (PTU) for all three trimesters of pregnancy
3. Start propylthiouracil for the first trimester, then switch to methimazole for the second and third trimester
4. Continue methimazole for the first trimester, then switch to propylthiouracil (PTU) for the second and third trimester

## Answer: 3 - Start propylthiouracil for the first trimester, then switch to methimazole for the second and third trimester

## Explanations:

- While methimazole is generally well-tolerated, propylthiouracil (PTU) is preferred during the first trimester of pregnancy due to the risk of teratogenicity associated with methimazole during early pregnancy including aplasia cutis and choanal or esophageal atresia. After the first trimester, the patient can be resumed on methimazole.
- Propylthiouracil has a black-box warning for the risk of hepatotoxicity, including severe liver injury and acute liver failure.
- Uncontrolled maternal hyperthyroidism can develop hypertension, increasing risk for spontaneous abortion, low birth weight, premature birth, or pre-eclampsia.
- When prescribing anti-thyroid medication, clinicians must educate the patients on the possible adverse effects. If the patient is started on methimazole, they must be aware that if they plan to become pregnant, they must notify the provider to switch their medication over to propylthiouracil. They should also have a plan for conception in place to decrease the risk of unexpected pregnancies and fetal teratogenicity with methimazole.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Thyrotoxicosis

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## Question 517: A 45-year-old woman with a BMI of 40 kg/m2 presents to the office seeking more information regarding bariatric surgery. She states she is afraid of losing weight too fast and wishes for a surgery that has the lowest risk of mortality. Which of the following is the most appropriate surgery for this patient?

## Choices:

1. Roux-en-Y gastric bypass
2. Biliopancreatic diversion
3. Sleeve gastrectomy
4. Adjustable gastric band

## Answer: 4 - Adjustable gastric band

## Explanations:

- The adjustable gastric band has the lowest rate of post-op morbidity and mortality of all bariatric surgeries, with its thirty-day mortality between 0%-0.1%.
- The adjustable gastric band is appealing to patients because it is reversible, and the band is easy to adjust for more (or less) weight loss.
- The adjustable gastric band has an approximately 1% risk of major complications if the procedure is performed laparoscopically. Long term, there is a two percent rate of issues per year.
- In comparison, sleeve gastrectomy and Roux-en-Y gastric bypass have a mortality rate of 0.5% at 30 days, and biliopancreatic diversion has the highest mortality rate of all bariatric surgeries at 1.1% at 30 days.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Post-Op Assessment and Management Of Obesity Surgery

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## Question 518:

A 21-year-old woman presents to the clinic for an acute visit. She complains of fatigue and shortness of breath that began 2 days ago. She has never had similar symptoms in the past. She has no significant past medical or surgical history. She lives in China and eats the typical local diet in the area. She does not use alcohol or tobacco and exercises twice a week. On physical examination, there are diffuse rales throughout all lung fields, normal S1, and S2, with an additional S3 noted. After further questioning the patient's diet, the clinician suspects a mineral deficiency causing the patient's symptoms. Which of the following foods is most likely to reduce the likelihood of developing similar symptoms in the future?

## Choices:

1. Corn
2. Wheat
3. Vegetables
4. Seafood

## Answer: 4 - Seafood

## Explanations:

- This patient has a dilated cardiomyopathy secondary to selenium deficiency.
- Selenium deficiency is a rare finding but is more common in areas of China, where the local diets are associated with foods lacking selenium.
- Children and women of childbearing age are most commonly affected.
- Dietary sources high in selenium include seafood, kidney, liver, and meat.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Selenium

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## Question 519:

A 7-month-old child is brought to the clinic with jaundice and failure to thrive. The mother gives a history of several episodes of irritability, vomiting, and lethargy during the last month. The patient's family recently immigrated from northern India. The patient is suspected to have a genetic disease, as levels of carbohydrate-deficient transferrin were found to be increased. Elimination of a simple sugar from the diet leads to an improvement in the symptoms. Which of the following cellular processes was inhibited when the patient presented?

## Choices:

1. attachment of n-glycans to asparagine
2. attachment of o-n galactosamine to serine
3. breakdown of long-chain fatty acids
4. transport of glucose into the cell

## Answer: 1 - attachment of n-glycans to asparagine

## Explanations:

- Hereditary fructose intolerance is a disease characterized by the inability of the liver to process fructose-1-phosphate.
- Fructose-1-phosphate is a powerful inhibitor of phosphomannose isomerase, the first step in n glycosylation.
- N-glycosylation involves attaching sugars to the N site of asparagine.
- Carbohydrate deficient transferrin can be used to monitor compliance with dietary measures for treating the disease.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hereditary Fructose Intolerance

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 520:

A 24-year-old female came to the emergency department with a history of sudden headaches over the past six hours. She had amenorrhea and breast discharge for the last six months. On examination, her blood pressure was found to be low at 100/60 mmHg. Magnetic resonance imaging of the head shows a sella-suprasellar mass measuring 3x2 cm. The visual field exam was normal. Her serum prolactin is 426 ng/ml (normal range 4.8-23.3), free T4 0.8 ng/dl (normal range 0.9-1.7 ng/dl) , random cortisol 2.2 mcg/dl (normal range 6-18.4 mcg/dl) and sodium is 128 mEq/L. What is the best way to manage this patient?

## Choices:

1. Start her on bromocriptine and hydrocortisone
2. Start her on cabergoline and hydrocortisone
3. Emergency transsphenoidal endoscopic decompression
4. Start her on cabergoline

## Answer: 2 - Start her on cabergoline and hydrocortisone

## Explanations:

- The patient is having pituitary apoplexy secondary to a lactotroph adenoma.
- The classic triad of symptoms in pituitary apoplexy is thunderclap headache, acute hypopituitarism, and visual disturbance.
- Patients with new-onset visual disturbance like acute vision loss within 24-72 hours or diplopia (in the absence of vision loss) should be considered for emergent surgical decompression.
- If the patient has a prolactinoma without vision loss, he/she can be managed medically with cabergoline. Hydrocortisone will have to be started to cover the acute hypocortisolism (denoted by the low sodium level) in this patient.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Pituitary Adenoma

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## Question 521:

A 56-year-old man with a past medical history of hypertension presents to the clinic for a regular checkup. His temperature is 37 C (98.6 F), pulse 69/min, respiratory rate 16/min, and blood pressure 134/88 mmHg. Aside from recommending dietary modification of a low-salt diet and inquiring about medication compliance, the clinician also prescribes vitamin D supplementation. Which of the following is the most likely mechanism by which vitamin D can affect his blood pressure?

## Choices:

1. Activating renin transcription
2. Activating angiotensin-1 transcription
3. Suppressing renin transcription
4. Suppressing angiotensin-1 transcription

## Answer: 3 - Suppressing renin transcription

## Explanations:

- Calcitriol binds intracellular vitamin D receptors (VDR) found in various types of cells.
- The activated VDR, in turn, induces transcription activation of certain genes and suppression of others.
- Recent studies indicated that calcitriol regulates the renin-angiotensin system (RAS) by decreasing renin expression via a VDR-mediated mechanism.
- Other studies have shown that calcitriol has also decreased the expression of angiotensin-1 receptors in endothelial cells via the same mechanism.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Cholecalciferol

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## Question 522: A 58-year-old white male presents with fatigue and dyspnea. He has a past medical history of poorly controlled hypothyroidism and is non-compliant with medical therapy. He is ultimately diagnosed with myxedema coma. How does myxedema coma impact the pulmonary system?

## Choices:

1. Hyperventilation
2. Hypoventilation
3. Decreased tidal volume
4. Increased dead spacing of the airways

## Answer: 2 - Hypoventilation

## Explanations:

- The pulmonary system typically manifests this disease process through hypoventilation secondary to central nervous system depression of the respiratory drive.
- Blunting of the physiological response to hypoxia and hypercapnia typically occurs in chronic cases.
- Additionally, metabolic dysfunction in the muscles of respiration leads to respiratory fatigue and failure.
- Macroglossia from mucopolysaccharide driven edema of the tongue leads to mechanical obstruction of the airway and obesity hypoventilation syndrome with decreased respiratory drive as many hypothyroid patients suffer from obesity.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Case Study: 60-Year-Old Female Presenting With Shortness of Breath

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## Question 523:

A 65-year-old African-American man with a history of hypertension, peripheral vascular disease, type 2 diabetes mellitus, and end-stage renal disease (ESRD) (on dialysis) presents to the clinic for follow up. His current medications include insulin glatiramer 20 units, carvedilol 12.5 mg BID, losartan 50 mg, and atorvastatin 40 mg. His labs show creatinine 9.8 mg/dL, BUN 27 mg/dL, hemoglobin 10.4 g/dL, hematocrit 33%, RBC count 3790000/microL, sodium 137 mEq/L, potassium 5.5 mEq/L, calcium 8 mg/dL, pH 7.24, phosphorous 4.7 mg/dL, total cholesterol 220 mg/dL, HDL 47 mg/dL, triglycerides 140 mg/dL, and LDL 160 mg/dL. Which of the following is the next best step in the management of this patient?

## Choices:

1. Increase the dose of atorvastatin
2. Initiate niacin
3. Discontinue atorvastatin
4. Initiate fenofibrate

## Answer: 3 - Discontinue atorvastatin

## Explanations:

- Atorvastatin is a high-intensity statin.
- It is indicated for patients with ASCVD (atherosclerotic cardiovascular disease) risk of >7.5%, patients with diabetes from age 40-70 with LDL- C >70mg/dL, clinically evident atherosclerotic cardiovascular disease (coronary artery disease, peripheral vascular disease, transient ischemic attack), and for patients with LDL-C >190 mg/dL.
- Research has proven that there are no cardiovascular benefits of statins for patients on dialysis.
- An increase in dose is not indicated here. Niacin is indicated for patients who are intolerant to statins or have a suboptimal response to statins. There was a lack of benefit in reducing LDL-C to 100mg/dl in patients undergoing dialysis, and hence either statin or niacin is not indicated here. Fenofibrate is indicated to treat hypertriglyceridemia if serum levels are >500 mg/dL. It is not a substitute for statins to reduce LDL-C and is not indicated here.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Polygenic Hypercholesterolemia

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 524:

A 65-year-old male presents to the clinic complaining that he has gained a significant amount of weight in his face, cheeks, the back of his neck, and abdomen. He also complains of erectile dysfunction, generalized weakness, worsening hyperglycemia, and is finding it difficult to control his hypertension despite strict adherence to his medication regimen over the last 2 years. A 1 mg dexamethasone suppression test reveals elevated serum adrenocorticotropin hormone (ACTH) levels ranging on repeated measures from 30-65 pg/mL. MRI scan of the brain reveals a 6-millimeter hypodense lesion suggestive of a microadenoma. What is the most diagnostically robust strategy to distinguish pituitary from ectopic ACTH syndrome in this patient?

## Choices:

1. Based on the presentation no further testing is needed and the patient should be referred to a skilled neurosurgeon for prompt trans-sphenoidal surgery.
2. Repeated serum ACTH measures
3. Corticotropin-releasing hormone stimulation test
4. Inferior petrosal sinus sampling with continuous corticotropin-releasing hormone stimulation

## Answer: 4 - Inferior petrosal sinus sampling with continuous corticotropin-releasing hormone stimulation

## Explanations:

- Despite the finding of a pituitary microadenoma and despite the fact that Cushing's disease is the most common etiologic basis for ACTH-dependent hypercortisolism, the age of this patient raises the significant possibility that the pituitary lesion may be a non-functional incidentaloma. The source of the ACTH excess may be ectopic therefore referral for elective transsphenoidal surgery would be unwise without further testing.
- This patient's clinical presentation is consistent with significant hypercortisolism and it does appear to be ACTH-dependent. Repeated ACTH measurements would not contribute any diagnostic information to help discern between pituitary versus ectopic ACTH secretion.
- The absolute degree of ACTH elevation has little discriminant value when discerning between pituitary and ectopic hypercortisolism. While there are reported series describing the use of the corticotropin-releasing hormone (CRH) test, the vasopressin tests, a combination of CRH and vasopressin, and the high dose dexamethasone test they all have contentious interpretation thresholds and limited sensitivity and specificity.
- The inferior petrosal sinus sampling (IPSS) procedure, when performed by adequately skilled interventional radiologists, has the best diagnostic value for making the distinction between pituitary Cushing's syndrome versus ectopic Cushing's syndrome.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hypercortisolism

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## Question 525: A patient with hyperlipidemia cannot tolerate statins. She recently started another medicine. She now complains of itching, nausea, vomiting, and epigastric pain. Vitals are normal, and she has mild epigastric tenderness on exam. Aminotransferases and prothrombin time are mildly elevated. Iron and salicylate levels are negative. Serial acetaminophen levels are negative. Which is the most appropriate treatment?

## Choices:

1. Whole bowel irrigation and deferoxamine infusion
2. N-acetylcysteine (orally, nasogastric tube or intravenous) for 48 hours
3. Stop the medication immediately and discharge with repeat liver function and prothrombin time testing
4. GI decontamination with activated charcoal, followed by IV pyridoxine

## Answer: 3 - Stop the medication immediately and discharge with repeat liver function and prothrombin time testing

## Explanations:

- The culprit is most likely sustained-release nicotinic acid, and the liver injury is usually self-limited.
- Stop the medication immediately and discharge with repeat liver function and prothrombin time testing.
- Whole bowel irrigation and deferoxamine is the treatment for iron toxicity. Iron, along with niacin, can be in supplements. It causes liver toxicity, but usually in the setting of severe illness.
- Activated charcoal and intravenous pyridoxine is the treatment for Isoniazid poisoning. It is usually given for seizures, not isolated elevation of liver function tests. N-acetylcysteine is the treatment for acetaminophen (APAP) toxicity, which is unlikely in this case, given that two separate levels in time are negative. However, consideration of APAP toxicity is mandatory when evaluating liver toxicity.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Niacin Toxicity

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## Question 526: A 70-year-old man presents with a 3-week history of increased sensitivity to heat, weight loss, palpitations, tremors, and diarrhea. His past medical history includes uncontrolled diabetes and chronic kidney disease requiring dialysis 3 times a week. Thyroid function tests demonstrate low TSH levels and high T3 and T4 levels, and a radioactive iodine scan is recommended. Which of the following patient factors will interfere with this test?

## Choices:

1. Diabetes
2. Kidney failure
3. Dialysis
4. Age over 65-years

## Answer: 2 - Kidney failure

## Explanations:

- Thyroid uptake of radioactive iodine plays a central role in the diagnosis of thyroid diseases and abnormalities in thyroid function.
- Kidney failure will cause increased accumulation of radioactive iodine and thyroid uptake and the scan will give false-positive results.
- Normal values of thyroid uptake of radiotracer are 3-16% at 6 hours and 8-25% at 24hours.
- Diabetes, age and the use of dialysis are not associated with aberrant results of thyroid uptake scans.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Thyroid Uptake and Scan

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## Question 527:

A 37-year-old woman with no significant past medical history presents to the clinic with a weight loss of 5 kg (baseline weight of 70 kg), diaphoresis, and palpitations for the last 4-weeks. Family history is significant for Graves disease. Physical examination is negative for orbitopathy, but mildly enlarged thyroid gland noted on palpation. Laboratory work-up shows thyroid-stimulating hormone (TSH) 12 IU/mL and free thyroxine (T4) 2.5 ng/dL. She is noted to have elevated thyroid peroxidase antibodies. She is subsequently prescribed symptomatic treatment. Which of the following best describes the role of cholestyramine in the management of this patient?

## Choices:

1. Decreases enterohepatic circulation of thyroid hormone
2. Increases enterohepatic circulation of the thyroid hormone
3. Increases production of thyroglobulin
4. Increases activity of iodothyronine deiodinase enzymes

## Answer: 1 - Decreases enterohepatic circulation of thyroid hormone

## Explanations:

- Cholestyramine is used to inhibit thyroid hormone reabsorption.
- Thyroid hormone is metabolized mainly in the liver, where it is conjugated to glucuronides and sulfates. These conjugation products are then excreted in the bile. Free hormones are released in the intestine and finally reabsorbed, completing the enterohepatic circulation of thyroid hormone.
- In states of thyrotoxicosis, there is increased enterohepatic circulation of thyroid hormone. Cholestyramine is an anion exchange resin that decreases reabsorption of thyroid hormone from the enterohepatic circulation.
- Cholestyramine, in combination with methimazole or propylthiouracil, causes a more rapid decline in thyroid hormone levels than standard therapy with thionamides alone.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Cholestyramine Resin

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## Question 528: A 29-year-old woman presents to the clinic seeking advice for weight loss. She has a history of hypertension and obstructive sleep apnea and has recently started using a continuous positive airway pressure (CPAP) machine. Physical examination reveals truncal obesity with widened abdominal striae and a round face. Hemoglobin A1c is 6.2%. Which of the following additional findings is most likely to be present in this patient?

## Choices:

1. Myxedema
2. Periumbilical hernia
3. Facial acne
4. Androgenic alopecia

## Answer: 3 - Facial acne

## Explanations:

- The most likely diagnosis in this patient is Cushing syndrome, which is characterized by facial acne.
- Cushing syndrome is a rare cause of secondary obesity.
- Cushing syndrome is characterized by moon facies, truncal obesity, abdominal striae (stretch marks), and fragile skin that bruises easily.
- Excess ACTH secretion (central), adrenal adenoma (peripheral), and paraneoplastic are possible etiologies. Most cases are iatrogenic.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Cushing Syndrome

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## Question 529:

A 43-year-old female is admitted to the hospital for uncontrolled diabetes. Her blood work show fasting blood sugar of 253 mg/dl ( 65-99), HbA1c of 11.3% ( 4.8- 56). Other pertinent history is significant for depression, which is being treated by her primary care physician. Her other complaints include painful rash over her face, buttocks, and extremities for which she has been using over-the-counter creams. She does complain of diarrhea over the past six months and has lost 30 pounds. Her physical examination reveals blood pressure 142/ 90 mm hg, pulse rate 102 beats per minute. On physical exam, she is anxious.You note an erythematous papular rash around her face and extremities. A biopsy of this lesion is consistent with " necrolytic migratory erythema." Which of the following test should be ordered to confirm the clinical diagnosis?

## Choices:

1. Serum glucagon level
2. Vitamin B12 level
3. Serum cortisol level
4. Serum lipase level

## Answer: 1 - Serum glucagon level

## Explanations:

- Her clinical presentation is consistent with glucagonoma syndrome, which usually presents with necrolytic migratory erythema in 90% of the patients. A fasting serum glucagon level should be drawn to confirm the diagnosis.
- Diabetes mellitus is present in about 80% of patients with glucagonoma syndrome.
- Depression can be seen in about 50% of patients with glucagonoma syndrome.
- Other conditions with necrolytic migratory erythema can include chronic liver disease, inflammatory bowel disease, pancreatitis, malignancy, etc.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Glucagonoma Syndrome

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## Question 530:

A 44-year-old female comes to your office due to increased appetite. She reports fatigue, palpitations, excessive perspiration, and weight loss. She has lost about 10 lbs in the last month. She states that she experiences intermittent diarrhea, which is often non-bloody and watery. She denies abdominal pain, vomiting, and chest pain. The patient describes her menstrual period as irregular. Her vitals show a temperature of 98.4 degrees F, pulse 94 beats per min, respiratory rate 18/min, and blood pressure of 136/86 mmHg. On physical exam, she is afebrile and not in distress. Her skin is warm and moist. Her eyelids are retracted, with both eyes protruding. The patient's thyroid exam reveals an enlarged thyroid. Clear vesicular breath sounds are noted bilaterally. Her cardiovascular exam yields normal S1 and S2 heart sounds, with no murmurs. Her abdomen is full and nontender. Ankle reflex is 3+ on both sides. Her lab test reveals antibodies against thyroid-stimulating hormone receptor with raised free T3 levels and low TSH levels. What human leukocyte antigen (HLA) is often associated with this patient's condition?

## Choices:

1. HLA-A3
2. HLA-B8
3. HLA-B27
4. HLA-DR5

## Answer: 2 - HLA-B8

## Explanations:

- This patient has Graves disease. This disease occurs when antibodies are produced against the thyroid-stimulating hormone receptor. This leads to the activation of the thyroid gland and the initiation of negative feedback on the hypothalamus-pituitary-thyroid feedback loop. This pathology is associated with HLA-B8.
- TSH level is often low due to the negative feedback on the hypothalamus-pituitary-thyroid axis, but free T3 and T4 levels are mostly increased secondary to thyroid activation.
- Clinically, patients with Graves disease present with symptoms of hyperthyroidism.
- They may also present with exophthalmos (protruded eyes).

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Physiology, Thyroid Function

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## Question 531:

A 22-year-old female patient presents to the clinic with a 5-month history of amenorrhea. She also complains of loss of libido, decreased body hair, headaches, and visual changes. She has a past medical history of bipolar disorder and hypothyroidism treated with olanzapine and levothyroxine. Her blood pressure is 118/80 mmHg, pulse 75/min, respirations 15/min, temperature 98.0 F (36.7 C). On examination, galactorrhea is present. She has decreased axillary and pubic hair. On visual examination, bitemporal hemianopsia is present. Laboratory results show thyroid-stimulating hormone 3.4 IU/mL (0.27-4.20), beta-hCG undetectable, and prolactin 175 ng/mL (3.4-24.1). What is the most likely cause of the patient's hyperprolactinemia?

## Choices:

1. Prolactinoma
2. Hypothyroidism
3. Pregnancy
4. Medication use

## Answer: 1 - Prolactinoma

## Explanations:

- Hyperprolactinemia may be due to pregnancy, prolactinoma, primary hypothyroidism, pituitary tumors, hypothalamic disease, dopamine antagonist medications, renal failure, cirrhosis, or idiopathic hyperprolactinemia. In this patient, headaches, visual changes, and bitemporal hemianopsia suggest mass effect, and a prolactinoma is most likely the source of the elevated prolactin levels.
- Primary hypothyroidism increases prolactin levels. In patients with primary hypothyroidism, thyroid releasing hormone (TRH) is elevated due to negative feedback, and elevated TRH causes elevation of prolactin. However, this patient's thyroid-stimulating hormone (TSH) is within the normal range, suggesting that her hypothyroidism is appropriately managed.
- Pregnancy is a physiological cause of hyperprolactinemia, as elevated estrogen levels in pregnancy stimulate lactotrophs and increase the secretion of prolactin. However, this patient had an undetectable beta-hCG.
- Medications resulting in hyperprolactinemia include dopamine antagonists, such as antipsychotics. Typical (first generation) antipsychotics and the atypical (second generation) antipsychotic risperidone are more likely to cause elevated prolactin levels. Olanzapine, which this patient was treated with, is less likely to cause hyperprolactinemia. Other medications that increase prolactin secretion are fluoxetine, phenytoin, cimetidine, verapamil, and methadone. Headaches, visual changes, and bitemporal hemianopsia suggest a prolactinoma as most likely the source of the elevated prolactin levels.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hyperprolactinemia

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## Question 532: A 50-year-old female presents to the outpatient department for evaluation. The patient was recently diagnosed with hypertension and was started on amlodipine. She was also encouraged to lose weight as her body mass index was recorded to be 32 kg/m2. She has a past history of diabetes mellitus, glaucoma, and hyperlipidemia. Her current examination is unremarkable, and her blood pressure is 130/75 mmHg. She has been unable to lose weight and asks about a drug her friend takes. The drug is designed to reduce weight and comprises a combination of a sympathomimetic agent and a broad spectrum anticonvulsant agent. Which of the patient's characteristics make her unsuitable for treatment with this modality?

## Choices:

1. History of hypertension
2. History of glaucoma
3. History of diabetes
4. History of hyperlipidemia

## Answer: 2 - History of glaucoma

## Explanations:

- This patient is a middle-aged female who is obese and has multiple obesity and non-obesity related comorbid conditions. Weight loss can help in the control of her diabetes and hypertension. She has had trouble reducing her weight with diet and exercise and requests pharmacological therapy. The agent being discussed is the combination-drug containing phentermine and topiramate.
- Phentermine and topiramate combination has been licensed for weight reduction in individuals with a body mass index greater than 30 kg/m2. The topiramate moiety has been associated with the development of acute angle-closure glaucoma.
- This drug should be avoided in individuals with a history of glaucoma. Topiramate has been associated with the development of acute angle-closure glaucoma and acute myopia in both children and adults. These symptoms usually occur within the first month of treatment.
- This drug should be discontinued in patients who report reduced visual acuity or ocular pain. Phentermine/topiramate leads to a reduction in weight and consequently, improvement in glycemic and blood pressure control. It is not contraindicated in patients with well controlled hypertension.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Topiramate And Phentermine

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## Question 533:

A 30-year-old white woman with a past medical history of vitiligo, autoimmune alopecia, diabetes mellitus type 1, and Addison disease presents to the clinic with weight gain and significant fatigue. Labs show TSH 34 mIU/L (reference range: 0.5-5 mIU/L), free T4 0.55 ng/dL (reference range 0.8-1.8 ng/dL), and thyroid peroxidase antibodies >1300 IU/mL. Which of the following best describes the most likely underlying etiology of her medical condition?

## Choices:

1. Autoimmune regulator (AIRE) gene mutation
2. HLA-DR3 and HLA-DR4 mutations
3. Menin 1 gene mutation
4. RET proto-oncogene mutation

## Answer: 2 - HLA-DR3 and HLA-DR4 mutations

## Explanations:

- This patient has polyglandular autoimmune syndrome type 2. Polyglandular autoimmune syndrome type 2 is diagnosed by the occurrence of at least 2 out of 3 manifestations, including Addison disease, autoimmune thyroid disease-causing (Graves disease or hypothyroidism), and T1DM.
- Other endocrine and non-endocrine manifestations of PAS-2 include primary hypogonadism, myasthenia gravis, celiac disease, alopecia, vitiligo, pernicious anemia, idiopathic heart block, Stiff-man syndrome, Parkinson disease, IgA deficiency, serositis, dermatitis herpetiformis, idiopathic thrombocytopenia, and hypophysitis.
- Polyglandular autoimmune syndrome type 2 is a polygenic disease, with significant heterogeneity due to multiple genetic loci and environmental factors responsible for the organ-specific damage.
- Mutation in HLA-DR3 and HLA-DR4 genes is commonly seen in polyglandular autoimmune syndrome type 2. A mutation in the CD25-interleukin-2 receptor gene, CTLA-4 gene, or protein tyrosine phosphatase can also cause autoimmune polyglandular syndrome type 2.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Polyglandular Autoimmune Syndrome Type II

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## Question 534:

A 45-year-old female patient with a history of systemic lupus erythematosus and glucocorticoid-induced osteoporosis comes to see her clinician because of a concern about the teriparatide treatment she has been recently started on. Although she is well tolerating the therapy and compliant with it, she mentions that she is bothered by what she came across in a social media forum for women's health that the drug she is using can cause bone cancer. Regarding the potential carcinogenic effect of teriparatide, the clinician should address the patient's concern by giving her which of the following information?

## Choices:

1. Teriparatide has been proven to cause bone cancers in humans
2. In an 8-year post-marketing surveillance study of teriparatide 10 cases of osteosarcoma were detected
3. Among 1 million users of teriparatide, the incidence of osteosarcoma was 10/3 000 000
4. The risk of teriparatide-associated osteosarcoma in humans is minimal and nonsignificant

## Answer: 4 - The risk of teriparatide-associated osteosarcoma in humans is minimal and nonsignificant

## Explanations:

- The risk of teriparatide-associated osteosarcoma in humans is considered to be minimal and nonsignificant.
- Teriparatide's carcinogenic effect has been established in a toxicity study on Fisher rats. It has not been established in humans.
- An ongoing post-marketing surveillance study of teriparatide use in humans showed no incident risk of osteosarcoma at 8-year interim analysis.
- Only 3 cases of osteosarcoma with unproven causality were detected in over 1 million patients treated with teriparatide.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Teriparatide

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## Question 535:

A 20-year-old man presents to the clinic for evaluation. His mother and sister were recently diagnosed with multiple endocrine neoplasias 4. His mother was also diagnosed with Zollinger Ellison syndrome. His sister had acromegaly. He currently has no complaints. He is fit and well. Physical examination is within normal limits. Genetic testing reveals a mutation in the CDKN1B gene. Which of the following additional findings is most likely to be found on further workup in this patient?

## Choices:

1. Elevated serum gastrin
2. Elevated serum IGF-1
3. Elevated serum prolactin
4. Elevated serum calcium

## Answer: 4 - Elevated serum calcium

## Explanations:

- The clinical vignette describes a fit and well patient being evaluated after his mother and sister were diagnosed with multiple endocrine neoplasias 4. Multiple endocrine neoplasias 4 (MEN4) is inherited as an autosomal dominant pattern. MEN4 commonly affects the parathyroid gland, pituitary gland, duodenal or pancreatic, gonadal, adrenal, renal, thyroid, or colon tumor.
- Hyperparathyroidism is the most common abnormality in MEN4. Therefore, elevated calcium and parathyroid levels are the most likely abnormality in the biochemical investigation.
- Duodenal and pancreatic neuroendocrine tumors can also occur in MEN4. However, they are less common than hyperparathyroidism.
- Acromegaly and Cushing disease has been reported in cases with multiple endocrine neoplasias 4. Prolactin levels can be raised due to the stalk effect of non-functional pituitary adenoma. Currently, no case of prolactinoma has been reported.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Multiple Endocrine Neoplasias Type 4

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## Question 536: A patient presents with a neck mass which has been confirmed as a medullary thyroid carcinoma (MTC) with a needle aspiration biopsy. What is the next step in the management of this patient?

## Choices:

1. Total thyroidectomy
2. Send urine for catecholamine analysis
3. Perform an open thyroid biopsy
4. Obtain a CT scan of the neck

## Answer: 2 - Send urine for catecholamine analysis

## Explanations:

- Medullary carcinoma of the thyroid originates in C cells of the thyroid. C cells produce calcitonin.
- Isolated cases of medullary cancer account for most tumors, but at least 25% occur in association with multiple endocrine neoplasia.
- In a patient with medullary cancer, it is essential to rule out pheochromocytoma, which can affect the morbidity.
- Serum calcitonin levels are a marker for medullary thyroid carcinoma, but to make a diagnosis of pheochromocytoma the urine needs to be analyzed for metanephrines.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Medullary Thyroid Cancer

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## Question 537:

A 60-year-old female was found in a semi-comatose condition and brought to the emergency department. On physical exam, her height was 66 inches (167.6 cm), and her weight was 123 lb (55.8 kg) (BMI=19.9 kg/m2). Her blood pressure was 80/40 mmHg; her pulse rate was 150 beats/min with a temperature of 99 F (37 C). She was disoriented and lethargic with normal deep tendon reflexes. Her home medications include aspirin and ketoconazole prescribed for onychomycosis of her toenails 6 months ago.Laboratory test results demonstrate: hemoglobin 9 g/dl; hematocrit 25%; WBC count 9840 cells/mm3; platelet count 297,000 cells/mm3; creatinine 1.09 mg/dl sodium 128 meq/l; potassium 5.2 mEq/L; chloride 93 mEq/L; and bicarbonate 18 mEq/L. Chest radiography and CT brain didn't reveal any abnormalities. Blood and urine cultures were sent. The patient was started on intravenous fluid resuscitation with broad-spectrum antibiotics. Which of the following is true regarding this medical condition?

## Choices:

1. Ketoconazole is a precipitating factor
2. The patient can present with hypocalcemia
3. Hyperglycemia is a common manifestation
4. Lymphopenia is a common manifestation

## Answer: 1 - Ketoconazole is a precipitating factor

## Explanations:

- The patient has an adrenal crisis precipitated by ketoconazole use. Manifestations include hypotension, tachycardia, hyponatremia, hyperkalemia with confusion. Ketoconazole interfere with steroidogenesis and clinicians should be aware that it can precipitate adrenal crises
- Confusion and lethargy are common manifestations of adrenal crises. The altered mental status can be exacerbated in the setting of hyponatremia and hypoglycemia due to the inhibition of gluconeogenesis. Slow correction of hyponatremia is required to avoid precipitation of osmotic demyelination syndrome
- Other medications that can precipitate adrenal crises are anti-adrenal medications, mitotane, metyrapone, anticancer medications, immune checkpoint inhibitors, tyrosine kinase inhibitors(sunitinib, imatinib), fluconazole, etomidate, rifampicin, cyproterone acetate, diuretics, and megestrol acetate.
- In adrenal crises, the patient usually presents with hypercalcemia secondary to dehydration, lymphocytosis, and eosinophilia.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Adrenal Crisis

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## Question 538: A 52-year-old woman with end-stage renal disease and calcium oxalate kidney stones presents with the desire to lose weight. She needs to lose 10 kg to be considered for a renal transplant. She could not lose enough weight with lifestyle modification, so she is interested in bariatric medication. Which of the following would be the most appropriate medication for this patient?

## Choices:

1. Naltrexone/buproprion ER
2. Orlistat
3. Liraglutide
4. Phentermine/topiramate ER

## Answer: 3 - Liraglutide

## Explanations:

- Liraglutide is the only medication which can be prescribed for anti-obesity purpose in patients with end-stage renal disease.
- Liraglutide is the only glucagon-like peptide-1 receptor agonist (GLP-1RA) approved for the treatment of obesity in patients without diabetes.
- GLP-1 is an incretin peptide secreted by the gut following oral food intake. It inhibits gastric emptying and glucagon release and induces glucose-dependent insulin release from the beta cell in the pancreas.
- All other antiobesity medications for long-term use are avoided in cases of end-stage renal disease, except orlistat. Orlistat is contraindicated in patients with a history of calcium oxalate stones.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Pharmacologic Therapy For Obesity

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## Question 539:

A 75-year-old man presents to the emergency room complaining of left-sided lower abdominal pain since this morning and reports that his urine is slightly red. He has vomited once this morning and has continued feeling nauseated. He has been seen multiple times within the past year for similar symptoms and was previously diagnosed with calcium stones by laboratory analysis. The patient has attempted dietary changes and is frustrated as he has given up many salty foods. The patient provides a urine sample and receives computed tomography imaging for diagnosis. After his current stone is passed, he has prescribed 25mg chlorthalidone daily. His labs return prior to discharge and reveal a total calcium at 11.4 mg/dl. What is the best next step for diagnostic workup?

## Choices:

1. Renal and bladder ultrasound
2. Bone marrow biopsy
3. Abdominal and chest radiograph
4. Measure serum parathyroid hormone

## Answer: 4 - Measure serum parathyroid hormone

## Explanations:

- The best initial step for diagnostic work-up of hypercalcemia, after confirmation by albumin correction, is to evaluate the patient's parathyroid hormone (PTH). The physical examination of a patient with primary hyperparathyroidism is usually normal.
- Hyperparathyroidism is the most common cause of elevated calcium levels. Primary hyperparathyroidism is a relatively common disorder that may cause significant renal and skeletal complications.
- Elevation of PTH can be due to hyperthyroidism, familial hypocalciuric hypercalcemia, or medication side-effect. Parathyroid hormone activates the parathyroid hormone receptor increasing resorption of calcium and phosphorus from bone, enhancing the distal tubular resorption of calcium, and decreasing the renal tubular resorption of phosphorus.
- If the PTH is suppressed, further evaluation regarding possible malignancy, causal medications, thyrotoxicosis, or vitamin-D toxicity should be considered. Bone marrow biopsy is evaluated in lymphoproliferative disorders. Abdominal and chest radiographs are not indicated in this scenario.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Calcium

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## Question 540:

A 57-year-old woman from Tokyo presents to the clinic for an annual wellness exam. Multiple anthropometric measurements are made. The patient is found to have a short upper leg length (ULL). BMI and waist circumference are normal. Which of the following is the most appropriate interpretation of these findings in this patient?

## Choices:

1. There is no clinical significance
2. Increased risk for metabolic syndrome
3. Increased risk for diabetes
4. Increased risk for renal disease

## Answer: 2 - Increased risk for metabolic syndrome

## Explanations:

- Short upper leg length can indicate risk for metabolic syndrome, more so than BMI or waist circumference.
- The relationship between short upper leg length and metabolic syndrome is for all ethnicities.
- ULL is measured from inguinal crease just inferior to ASIS to the distal end of the femur.
- ULL is reliable because, unlike trunk length, which shrinks due to osteoporosis, ULL remains relatively stable throughout life.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Anthropometric Measurement

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## Question 541:

A 36-year-old man is being evaluated for medically intractable high blood pressure. After a detailed workup, his urinary vanillyl mandelic acid (VMA) and 24-hour urine metanephrines levels are found to be elevated. His CT abdomen reveals a 3 cm left suprarenal mass. The patient is then scheduled for an mIBG scan for confirmation of diagnosis. Which of the following drug is most appropriate to be discontinued prior to the scheduled mIBG scan?

## Choices:

1. Labetalol
2. Prazosin
3. Phenoxybenzamine
4. Atenolol

## Answer: 1 - Labetalol

## Explanations:

- Some pharmacological agents are known to interfere with the uptake and storage of mIBG inside the tumor cells.
- These drugs should be discontinued prior to the mIBG scan, as they may cause misinterpretation of the scan.
- The patient must be started on medications that do not alter the scan results (especially in the case of catecholamine secreting tumors).
- Phenoxybenzamine, prazosin, and atenolol are safe alternatives for a patient undergoing an mIBG scan.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Nuclear Medicine Oncology Assessment, Protocols, And Interpretation

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## Question 542:

A 23-year-old female is brought in to the hospital after being involved in a motor vehicle collision. She reports a minor headache but no other aches or symptoms. On physical exam, she has normal vital signs. Her BMI is 20 kg/m2. She has a small bruise over her right temple region but no other bruises, scrapes, or cuts anywhere over her body. Her initial labs are within normal limits. CT brain does not show any bleeding; however, it does reveal a pituitary mass. This is confirmed with an MRI and is found to be of 1.1 cm with suprasellar extension towards the optic chiasm but not compressing the chiasm or the nerves. She has further evaluation with a visual field test that shows preserved vision in all directions. Further laboratory testing is as follows: prolactin 19 ng/mL (normal: 20 in women), thyroid-stimulating hormone (TSH) 2.2 mcu/L (normal: 0.5-5.0 mcu/L), free thyroxine (FT4) 1.2 (normal: 0.8-1.8 ng/dL), insulin-like growth factor 1 (IGF-1) 460 ng/mL (normal for age: 113-297 ng/mL), luteinizing hormone (LH) 30 IU/L (normal: 20-80 IU/L for midcycle, female), follicle-stimulating hormone (FSH) 18 mcu/L (normal: 4-36 mcu/mL for midcycle, female). A glucose tolerance test confirms the high likelihood of the tumor being a somatotrophic pituitary macroadenoma. Which of the following is the best next step?

## Choices:

1. Proceed with stereotactic radiosurgery (SRS) and observe for symptoms
2. Transsphenoidal biopsy of the mass for staging and grading of the pituitary tumor
3. Prescribe a somatostatin analog and repeat MRI imaging in 1 year
4. Transsphenoidal resection of mass followed by octreotide administration

## Answer: 4 - Transsphenoidal resection of mass followed by octreotide administration

## Explanations:

- There are several treatment options for treating pituitary tumors. Tumors are classified as micro- or macroadenomas and need to have laboratory testing to determine if these are hypo or hypersecretory masses. 0.2% of pituitary masses are malignant carcinomas, and therefore no staging or grading system exists.
- Somatotrophic macroadenomas are adenomas with an excess of growth hormone production. Insulin-like growth factor 1 (IGF-1) elevation is very common and routinely tested early in the workup of a pituitary tumor and is followed by a growth hormone (GH) suppression test. All growth hormone-producing tumors, regardless of symptoms, require transsphenoidal surgical resection as first-line therapy. Somatostatin analogs, such as octreotide, are then used to suppress remaining tumor tissue, and can often require repeat surgery to remove 100% of the adenoma.
- Macroadenomas that are found to be nonsecretory and do not cause and vision loss need to be followed with an MRI after 6 months of diagnosis. An increase in size or growth towards the optic nerves and chiasm should prompt consultation for surgical resection. Secretory adenomas almost always require medical, surgical, radiological, or a combination of them all at the time of diagnosis.
- Stereotactic radiosurgery (SRS) is a form of radiological treatment with gamma rays. Radiological therapy is never done alone and only augments medical or surgical therapy.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Pituitary Cancer

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## Question 543: A nine-year-old female presents to the clinic with a six-month history of severe restriction in mobility of both upper limbs that precluded self-feeding. On examination, there are multiple, ill-defined bony swellings in the soft tissues along the chest wall, arms, and forearms. Also, she has bilateral hallux valgus. Which of the following is considered curative treatment for this patient's suspected condition?

## Choices:

1. Surgery to excise the bony swellings
2. Palovarotene
3. Sevelamer
4. There is no cure for this disease

## Answer: 4 - There is no cure for this disease

## Explanations:

- This clinical scenario, including the history and physical examination findings, points towards a diagnosis of fibrodysplasia ossificans progressiva (FOP).
- There is no cure for this disease. The current management strategies include some drugs being used in clinical trials.
- Palovarotene is a retinoic acid receptor gamma agonist, which has been used for this disease and is reported to inhibit heterotopic ossificans in animal studies.
- Surgery, or any form of trauma, is contraindicated in these patients as it triggers the formation of new heterotopic masses. Sevelamer is a phosphate-binding resin used in patients with hyperphosphatemic tumoral calcinosis.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Fibrodysplasia Ossificans Progressiva

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## Question 544:

A 57-year-old man is referred for evaluation of hypercalcemia. A review of medical records shows his corrected serum calcium ranging from 9.6 to 11.8 mg/dL for the past four years. Investigations done reveal calcium 11.2 mg/dL (8.6-10.3), albumin 4.1 g/dL, parathyroid hormone (PTH) 134 pg/mL (15-65), and glomerular filtration rate (GFR) 56 ml/min. Dual-energy x-ray absorptiometry shows osteopenia, and no renal stones are seen on an ultrasound of the kidneys. 24-hour urine calcium excretion is 246 mg. An ultrasound of the neck and parathyroid scan followed by parathyroid surgery is recommended. However, the patient adamantly refuses to consider surgery. Which of the following should be done next?

## Choices:

1. Continue 4 to 6 monthly clinical monitoring with serial labs
2. Order the parathyroid scan
3. Work up for malignancy associated hypercalcemia
4. Treat with cinacalcet

## Answer: 4 - Treat with cinacalcet

## Explanations:

- His calcium level is greater than 1 mg/dL above the upper limit of normal. This makes him a candidate for clinical intervention. Clinical monitoring may not be sufficient to minimize the risks of potential complications.
- Cinacalcet is an agonist to the CaSR thus decreasing parathyroid hormone (PTH) secretion and reducing the degree of hypercalcemia. Patients who are candidates for parathyroid surgery but refuse or are high risk for a surgical procedure can benefit from treatment with cinacalcet.
- PTH is suppressed in malignancy-induced hypercalcemia. His PTH is high, so tests to determine if a malignancy is the cause of his hypercalcemia is not indicated.
- Cinacalcet is an agonist to the CaSR thus decreasing PTH secretion and reducing the degree of hypercalcemia. Patients who are candidates for parathyroid surgery but refuse or are high risk for a surgical procedure can benefit from treatment with cinacalcet.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Primary Hyperparathyroidism

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## Question 545:

A woman who previously considered herself in good health and was on no medications had a myocardial infarction at age 49. Her total cholesterol was 233 mg/dL, triglycerides 140 mg/dL, HDL-C 26 mg/dL, LDL-C 179 mg/dL. She is started on high-intensity statin therapy with atorvastatin 40 mg daily. Six weeks later her LDL has decreased to 120 mg/dL, and the atorvastatin dose is increased to 80 mg daily. She is tolerating this dose well, and a repeat LDL-C 2 months later is 115 mg/dL. Evidenced-based data supports which one of the following statements?

## Choices:

1. Her risk of abnormal liver enzymes and myalgia is similar whether PCSK9 antibody or ezetimibe is added
2. Adding a PCSK9 antibody will decrease her LDL-C, apoprotein B, and apoprotein A levels
3. Since she is already on high-intensity statin therapy with atorvastatin 80 mg daily, her LDL-C can be expected to decrease by 20% to 25% if a PCSK9 antibody is added
4. Both statins and PCSK9 antibodies reduce the activity of PCSK9

Answer: 1 - Her risk of abnormal liver enzymes and myalgia is similar whether PCSK9 antibody or ezetimibe is added

## Explanations:

- Data from several studies have not shown an increase in liver- or muscle-related adverse events in subjects randomized to PCSK9 antibodies compared to those randomized to ezetimibe.
- PCSK9 antibodies lower LDL-C and apoprotein B levels but increase the levels of apoprotein A.
- The expected decrease of LDL-C with PCSK9 inhibitors is in the range of 50% to 70% whether used as monotherapy or in combination with a statin.
- Statins increase clearance of LDL-cholesterol but also cause an increase in PCSK9 activity.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### PCSK9 Inhibitors

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## Question 546:

A 50-year-old female presents to the clinic with generalized weakness and difficulty in walking for the past three to four months. She has more difficulty in climbing stairs, combing hair, and standing from the chair. She denies fever, pain, trauma, numbness, paresthesia, urinary, or bowel symptoms. On further inquiry, she reveals that she has constipation, sleeps a lot, and has gained 12 kgs of weight even though her appetite has decreased. On physical examination, her skin seems dry. Muscle strength is 3/5 in proximal muscles and 4/5 in distal muscles of both upper and lower limbs. Deep tendon reflexes are present with delayed relaxation. What is the next step in the diagnosis of this condition?

## Choices:

1. Creatine kinase (CK)
2. Thyroid-stimulating hormone (TSH)
3. Electromyography
4. Hemoglobin A1c

## Answer: 2 - Thyroid-stimulating hormone (TSH)

## Explanations:

- The patient is most likely having myopathy, secondary to hypothyroidism. Thyroid-stimulating hormone (TSH) should be checked to confirm the diagnosis.
- Creatine kinase (CK) is a non-specific test and can be elevated in almost all myopathies.
- Electromyography (EMG) may reveal features of myopathy, but it will not differentiate hypothyroid myopathy from other causes of myopathy.
- In patients with symmetrical polyneuropathy in glove and stocking distribution, hemoglobin A1c is usually checked to look for underlying diabetes mellitus

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hypothyroid Myopathy

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## Question 547:

A 25-year-old white man presents to the emergency department with nausea, vomiting, weight loss, and skin darkening over the last four weeks. He has a past medical history of hypothyroidism due to Hashimoto thyroiditis and vitiligo. He takes levothyroxine 100 mcg daily. His vitals show blood pressure 80/60 mmHg with orthostatic hypotension, pulse 100/min, temperature 37 C, and respiratory rate is 16/min. He is alert and oriented to time, place, and person. He denies any recent contact with a sick person and did not travel outside the country in the last six months. Initial labs show a white blood cell count of 5500/microL, serum sodium 130 mEq/L, and serum potassium 3.1 mEq/L. What is the most likely diagnosis?

## Choices:

1. Adrenal insufficiency
2. Myxedema coma
3. Severe sepsis
4. Septic shock

## Answer: 1 - Adrenal insufficiency

## Explanations:

- Adrenal insufficiency due to adrenalitis is one of the most common manifestations in polyglandular autoimmune syndrome type 2.
- The most common symptoms of adrenal insufficiency are anorexia, fatigue, nausea, vomiting, diarrhea, weight loss, and hyperpigmentation.
- The most common biochemical abnormalities of adrenal insufficiency are hyponatremia and hypokalemia.
- The presence of 21-hydroxylase or 17-hydroxylase autoantibodies can confirm autoimmune adrenalitis.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Polyglandular Autoimmune Syndrome Type II

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## Question 548:

A 19-year-old woman presents to the office diaphoretic, tremulous, and anxious. She has a BMI of 17.8, blood pressure of 152/92 mmHg refractory to medication, and tachycardia. Her mother accompanies her to the visit and says that she does not understand why her daughter is not gaining weight because she eats all the time. She has no erosive dentition or cuts on the backs of her fingers. The remainder of her exam is normal. Medication abuse is suspected. Which of the following is most likely to happen if she continues misuse of this medication?

## Choices:

1. Palpitations, ventricular arrhythmias
2. Nothing more than her current signs/symptoms
3. Fever, flushed skin, delirium, dry mouth, decreased diaphoresis, mydriasis
4. Blindness, seizures

## Answer: 1 - Palpitations, ventricular arrhythmias

## Explanations:

- Ephedrine was a previously famous weight loss supplement in the early 2000s. It aids fat loss by increasing metabolism through adrenergic stimulation.
- Long term use of ephedrine can cause catecholamine excess that can result in contraction band necrosis of the myocardium which predisposes the heart to ventricular arrhythmias.
- Ephedrine is not a controlled substance in most facilities and therefore has no mechanism in place to track possible diversion. It has been used for weight loss, athletic performance, increasing alertness, and decreasing nasal congestion.
- Due to being linked to ventricular arrhythmias, ephedrine was pulled from supplements in the early 2000s. While answer choice 3 may be considered, these symptoms fit more consistently with anticholinergic toxicity which is less likely to be abused for weight loss supplementation than ephedrine.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Ephedrine

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## Question 549: A 3 month-old female infant born at home with no medical care presents with umbilical hernia, hoarse cry, and enlarged tongue. She has a coarse face, thick hair, and dry skin. What is the most worrisome consequence of this condition if untreated?

## Choices:

1. Cholestasis
2. Neurodevelopmental delay
3. Delayed bone maturation
4. Soft tissue myxedema

## Answer: 2 - Neurodevelopmental delay

## Explanations:

- Neurodevelopmental delay is a feared complication of untreated congenital hypothyroidism.
- It is irreversible if not diagnosed early and treated with thyroxine hormone.
- Neonatal jaundice and delayed growth and maturation are also common.
- In some cases, severe impairment in linear growth and bone development which in combination with the neurological problems leads to difficulty in gait, spasticity and autistic behavior.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Congenital Hypothyroidism

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## Question 550:

A 16-year-old female with primary adrenal insufficiency presents in the emergency department with complaints of severe colicky abdominal pain and profuse watery diarrhea after eating raw oysters for the past twelve hours. Her current medication is hydrocortisone 15 mg daily and fludrocortisone 0.1 mg daily. Her vitals show a heart rate of 135 beats per minute, a respiratory rate of 28 breaths per minute, a blood pressure of 72/30 mmHg, and a temperature of 38.1 Celcius. On physical exam, there is a presence of dry mucous membranes and diffuse abdominal tenderness. She is started on intravenous fluids. What should be the next step in the management of this patient?

## Choices:

1. Start vasopressor infusion
2. Administer hydrocortisone 100 mg intravenously
3. Begin empiric antibiotics
4. Order an ultrasound of the abdomen

## Answer: 2 - Administer hydrocortisone 100 mg intravenously

## Explanations:

- A patient with adrenal insufficiency and severe infection needs stress steroids.
- Hydrocortisone 100 mg IV would be appropriate.
- An undiagnosed patient who has hypotension and suspected adrenal insufficiency should be given dexamethasone. Dexamethasone will not interfere with further diagnostic testing. As it does not have mineralocorticoid properties, fluids and electrolyte replacement are needed.
- In untreated patients, death is usually from septic shock, hypotension, or cardiac arrhythmias.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Adrenal Insufficiency

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## Question 551:

A 45-year-old woman with a past medical history of gastroesophageal reflux disease (GERD) and recurrent nephrolithiasis presents to the clinic for a follow-up visit. She was recently diagnosed with parathyroid adenoma about 6 weeks ago. Her only symptoms at that time were intermittent colicky flank pain, nausea, and polyuria. Computer tomography of the abdomen reveals nonobstructive kidney stones. She is hydrated and discharged home from the emergency department with ibuprofen and tamsulosin with a consequent resolution of symptoms. Neck ultrasound reveals a 2 cm hypoechoic nodule on the right parathyroid lobe. Her physical exam and vital signs are within normal limits. An initial set of investigations is shown below.

| | Patient value | Reference range |
|---|---|---|
| Calcium | 11.5 mg/dL | 8.5-10.2 mg/dL |
| Serum creatinine | 0.5 mg/dL | 0.8-1.4 mg/dL |
| BUN | 15 mg/dL | 5-20 mg/dL |
| Parathyroid hormone | 67 pg/mL | 14-65 pg/mL |
| Potassium | 3.6 mEq/L | 44-147 IU/L |

Which of the following is the most appropriate management strategy for this patient's hypercalcemia?

## Choices:

1. Repeat neck ultrasound in 6 to 12 months
2. Denosumab
3. Pamidronate and calcitonin
4. Elective parathyroidectomy

## Answer: 4 - Elective parathyroidectomy

## Explanations:

- This patient likely has parathyroid adenoma and meets the criteria for elective parathyroidectomy. This includes serum calcium of 14 mg/dL (>1 mg/dL the upper limit of normal), associated symptoms, and the presence of stone formation or calcifications on a radiograph, ultrasound, or computer tomography.
- She should therefore be referred to a surgeon for elective parathyroidectomy, which leads to resolution of hypercalcemia in such cases.
- Parathyroid adenomas are benign tumors of the parathyroid gland that secret excessive amounts of parathyroid hormone thereby significantly raising serum calcium levels. Surgery is curative for parathyroid adenomas.
- Denosumab, bisphosphonates, and calcitonin can all be used for the management of hypercalcemia; however, it will not resolve elevated serum calcium levels secondary to parathyroid adenomas. Parathyroid tumors need to be addressed after diagnosis to avoid complications from severely elevated calcium levels. Therefore, surveillance and repeat imaging in 12 months is not the best management strategy.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Resistant Hypercalcemia

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## Question 552:

A 47-year-old man presents to the office for a routine medical examination. He has type 2 diabetes mellitus and works as a truck trailer. He takes metformin for his diabetes and an over the counter pill for his seasonal allergies. On physical examination, he is a well-built adult male. No abnormalities are detected on a thorough examination of all systems. No evidence of diabetic neuropathy is detected on a detailed neurological examination. Which of the following is the next best step in the management of this patient?

## Choices:

1. Provide the patient with a refill for his metformin
2. Renal function testing
3. Confirm the name of his allergy medication
4. Switch metformin to insulin

## Answer: 3 - Confirm the name of his allergy medication

## Explanations:

- Antihistamine drugs are the most common over the counter medications available for allergies. The commonest side effect of these medications is excessive sleepiness.
- Drugs that cause excessive sleepiness should not be used while operating motorized vehicles, heavy machinery, etc. Since the patient is a truck driver by profession, it would be dangerous to take over the counter allergy medications.
- Individuals that operate heavy machinery should be given nonsedating alternatives for allergies.
- Switching to insulin is not indicated and would, in fact, be contraindicated in patients operating heavy machinery or driving.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Medication Dispensing Errors And Prevention

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 553:

A 49-year-old man was admitted for a total thyroidectomy because of a suspicious thyroid nodule. His post-operative course is benign with no complications. His wounds are healing well and his vital signs are stable. Regular laboratory tests including complete blood count and electrolytes levels are significant for calcium level of 8.0 mg/dL (normal range is 8.5-10.2 mg/dL). The patient denies paresthesia, numbness or muscle cramps. Physical examination is within normal limits and the patient has negative Chvostek's and Trousseau's signs. What test would be most helpful in evaluating this patient?

## Choices:

1. Serum sodium
2. Serum albumin
3. Serum alkaline phosphatase
4. 24-hour urine calcium excretion

## Answer: 2 - Serum albumin

## Explanations:

- In the absence of signs or symptoms of hypocalcemia, the serum albumin should be measured and used to calculate the corrected calcium level.
- The formula for the corrected calcium concentration is measured calcium + 0.8 x (4.0 - albumin) (where calcium is measured in mg/dL and albumin is measured in g/L).
- Another option for patients without signs or symptoms of hypocalcemia is to measure ionized calcium.
- Chvostek's sign is elicited by tapping over the facial nerve as it exits from the parotid gland. The increased neuromuscular irritability leads to the ipsilateral twitching of the upper lip and side of the mouth. Trousseau's sign is checked for by inflating a blood pressure cuff 10 to 20 mmHg over-systolic blood pressure. A positive sign is the development of carpal spasm with flexion of the thumb and adduction of the finger within three minutes. This can be quite painful so the time should be noted and the cuff deflated once the test is positive.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hypoparathyroidism

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## Question 554:

A 7-year-old with type 1 diabetes had one episode of emesis and 3 episodes of diarrhea yesterday. She has decreased appetite but says she is hungry this morning. Blood sugars were 90 last night and 300 this morning. Urine ketones were trace positive last night and today. AM insulin is 10 units of human recombinant isophane suspension 10 units and human insulin 4 units with evening dosage of 5 units human recombinant isophane and 2 units human insulin. What is the next best step in the management of this patient?

## Choices:

1. Give only clear liquids and 8 units of regular human insulin
2. Give clear liquids for breakfast and give 10 units of insulin isophane and 8 units of regular. Recheck blood sugar in 4 hours
3. Give a normal breakfast and give 12 units of insulin isophane and 4 units of regular. Recheck blood sugar in 4 hours
4. Give clear liquids and 10 units insulin isophane and 4 units regular

## Answer: 2 - Give clear liquids for breakfast and give 10 units of insulin isophane and 8 units of regular. Recheck blood sugar in 4 hours

## Explanations:

- Close monitoring of blood sugar is the most important.
- The presence of ketones indicates the need for more regular insulin.
- Regular human insulin peaks at 2 to 3 hours and lasts 4 to 6 hours.
- Isophane human insulin peaks at 6 to 10 hours.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Diabetes Mellitus Type 1

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## Question 555:

A 40-year-old female with a history of HIV and hypertension was brought to the emergency department by her son as she was confused for the past 2 days. She also has been complaining of severe diffuse abdominal pain with nausea and vomiting. Her home medication included megestrol acetate and triumeq (each tablet contains 50 mg dolutegravir, 600 mg abacavir, and 300 mg lamivudine). As per her son, the patient ran out of medication around 2 weeks ago. On physical exam, she was confused. The abdominal exam revealed diffuse tenderness, without rebound tenderness. She had normal deep tendon reflexes. The patient was hypotensive, tachycardiac with hyponatremia, hyperkalemia, and anemia in her laboratory testing. Intravenous fluids were started along with broad-spectrum antibiotics however the patient remained hypotensive requiring vasopressors. Which of the following is true regarding the patient 's medical condition?

## Choices:

1. The use of triumeq precipitated this medical condition
2. HIV is not considered a risk factor for this condition
3. The use of megestrol acetate precipitate this medical condition
4. There is a decrease in interleukin 1 and 6

## Answer: 3 - The use of megestrol acetate precipitate this medical condition

## Explanations:

- The patient has an adrenal crisis precipitated by megestrol acetate. She has hypotension, tachycardia, hyponatremia with hyperkalemia which are typical mainfestation of adrenal crises. Reviewing the patient's home medication list is essential when there is high suspicion for adrenal crises
- Megestrol acetate is used to treat loss of appetite and weight loss; however, it causes symptomatic suppression of the hypothalamic-pituitary-adrenal (HPA) axis owing to its intrinsic glucocorticoid-like effect.
- Patients with adrenal crises usually present with unexplained shock, which is refractory to vasopressors and fluids. Abdominal pain, nausea, and vomiting are common. Classic lab features of the disorder will reveal hyponatremia, hyperkalemia, and hypoglycemia.
- In adrenal crises, there is an increase in inflammatory markers including TNF alpha, interleukin 1 and 6 which contribute to cortisol resistance. HIV and different infections can precipitate adrenal crises.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Adrenal Crisis

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## Question 556:

A 65-year-old woman presents with back pain and fatigue. She is found to have a hematocrit of 30%. Her MCV is 96 fl, and RDW is normal at 13%. Her WBC is 4,400/mm3. Her platelet count is 120,000/mm3 and creatinine is 1.2 mg/dL. Iron studies are done, which reveal a normal iron, normal TIBC, and normal saturation. Her ferritin is normal at 150 ng/ml. Her total protein is elevated at 9.1 mg/dl, while her albumin is 3.1 mg/dl. Her urine dipstick is positive for 1+ protein. Which of the following tests is most likely to reveal the underlying etiology in this patient?

## Choices:

1. Soluble serum transferrin receptor level
2. Tissue transglutaminase and anti-endomysial antibodies
3. 24-hour urine for creatinine clearance
4. Serum protein electrophoresis

## Answer: 4 - Serum protein electrophoresis

## Explanations:

- The presentation described here suggests multiple myeloma, which should be evaluated with a serum protein electrophoresis. Diagnosis is not always obvious, especially in older patients, given their increased comorbidities. Multiple myeloma should always be suspected in an elderly patient with normocytic anemia, bone pain and evidence of renal dysfunction.
- The patient has normal iron levels, making the diagnosis of celiac disease unlikely. As a result, there is no use in testing for celiac disease with tissue transglutaminase and anti-endomysial antibodies.
- This patient has anemia of chronic disease, and this testing for serum transferrin receptor will be elevated, but will not help in diagnosis.
- A serum protein electrophoresis will be helpful in diagnosing plasma cell dyscrasia, such as multiple myeloma with the presence of M spike.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Multiple Myeloma

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## Question 557:

A 65-year-old male presents to the clinic with numerous fainting episodes and headaches for the past seven months. According to the patient, each episode lasts for around 4 minutes. Having some honey during the episodes has been found to help with the symptoms. The patient is also sad that he has put on 10 pounds (4.5 kg) in the past four months despite no change in his diet. The blood workup reveals elevated levels of insulin, proinsulin, and c-peptide. A CT scan reveals an isolated mass in the pancreas. The patient does not want any surgery and inquires the physician if he can be treated with a drug instead. A drug is suggested, which can prevent the patient's hypoglycemic events by opening ATP-dependent potassium channels on pancreatic beta cells in the presence of ATP and Mg2+, resulting in hyperpolarization of the cell and inhibition of insulin release. Which of the following is a known side effect of this drug?

## Choices:

1. Edema
2. Flushing
3. Tinnitus
4. Bronchoconstriction

## Answer: 1 - Edema

## Explanations:

- The characteristic clinical manifestation of an insulinoma is fasting hypoglycemia, (although some patients also have postprandial hypoglycemia), with neuroglycopenic symptoms that may or may not be preceded by sympathoadrenal (autonomic) symptoms.
- For initial therapy of patients with benign, solitary insulinomas, surgical excision of the tumor is recommended.
- For patients whose insulinoma cannot be located during pancreatic exploration, who are not candidates for or refuse surgery, diazoxide therapy is used for the medical management of hypoglycemia.
- Diazoxide is sometimes used for controlling hypoglycemia. It works by decreasing insulin secretion and is given in divided doses of up to 1200 mg/day. However, it can cause marked edema which may require high doses of loop diuretics.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Insulinoma

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## Question 558:

A 10-year-old Hispanic boy is brought to the clinic by his mother for an annual wellness visit. He denies any physical complaints. His mother complains that he has been growing so quickly she has to keep buying him longer pants. She is surprised that he is so tall already and that he is already taller than both his mother and father, as well as everyone else in the family. His vital signs are within normal limits for his age, although he is in the 96th percentile for height. On examination, he has mild gynecomastia. A genitalia exam reveals Tanner 1 development, a normal-appearing phallus, and descended but somewhat small testicles bilaterally. What is the most likely genotype associated with the patient's condition?

## Choices:

1. 47,XYY
2. 47,XXX
3. 47,XXY
4. 45,XO

## Answer: 3 - 47,XXY

## Explanations:

- Klinefelter syndrome is a disease that should be considered and ruled out before making the diagnosis of Jacobs syndrome.
- Klinefelter syndrome is another sex chromosome abnormality in which the patient's genotype is 47,XXY.
- Key features of Klinefelter syndrome include tall stature, gynecomastia, small testes, learning disabilities, and, at times, infertility.
- Klinefelter syndrome may also be ruled out via genetic analysis.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Jacobs Syndrome

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## Question 559:

A 20-year-old woman presents with complaints of constipation, fatigue, generalized malaise, and menstrual irregularities for the past 5 months. The patient also reports weight gain. She has a past medical history of a childhood brain tumor, which was treated with radiotherapy followed by surgical excision. On examination, delayed deep tendon reflexes are observed. What is the best next step in the management of this patient?

## Choices:

1. CT scan of the brain
2. Thyroid function tests
3. Serum electrolytes
4. Renal function tests

## Answer: 2 - Thyroid function tests

## Explanations:

- This patient's symptoms are suggestive of hypothyroidism. Thyroid function tests should be performed in this client, as radiation to the brain can disrupt the hypothalamic-pituitary axis.
- Secondary or central hypothyroidism is labeled when the thyroid gland itself is normal, and the pathology is related to the pituitary gland or hypothalamus.
- Serum TSH level is used to screen for primary hypothyroidism in most patients.
- Central hypothyroidism is of pituitary or hypothalamic origin. TSH produced can be biologically inactive and can affect the levels of bioactive TSH, hence the diagnosis of central hypothyroidism should be based on free T4 rather than TSH.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Adverse Effects Of Radiation Therapy

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## Question 560:

A 43-year-old white female presents with a neck mass. She incidentally observed the mass two weeks ago while taking a shower. She denies a family history of thyroid disease. She underwent chemotherapy and radiation for a non-Hodgkin lymphoma 25 years ago. She works as a traffic sergeant and lives with her female partner. The patient denies fever, chills, change in weight, or changes in bowel habits. Currently, she is afebrile and hemodynamically stable. Physical examination reveals a 3.1 cm in diameter anterior neck mass that does not move with swallowing. Her thyroid-stimulating hormone level is 3.1 mU/L, a thyroid ultrasound reveals a 3.2 × 2.9 cm hypoechoic solid right thyroid nodule with irregular margins, and right-sided cervical lymphadenopathy is confirmed by ultrasonography. Which of the following is the most likely feature of a biopsy of this neck mass?

## Choices:

1. Secretes calcitonin
2. Psammoma bodies
3. Invades thyroid capsule and vasculature
4. Stains with Congo red

## Answer: 2 - Psammoma bodies

## Explanations:

- Thyroid radiation exposure in childhood is the strongest environmental risk factor for thyroid cancer, most commonly papillary thyroid cancer (PTC).
- The two cardinal morphological features of conventional PTC are the papillae and nuclear changes.
- The papillae are composed of a central fibrovascular stalk covered by a neoplastic epithelial lining. The papillae may be long, straight, or arborizing, arranged in a parallel, regimented fashion, short and stubby, or tightly packed. The thickness and composition of the papillary stalk are variable. The stalk is usually made up of loose connective tissue and variously sized thin-walled vessels.
- PTC usually presents as an asymptomatic (painless) thyroid mass with or without enlargement of regional (cervical) lymph nodes. There may be the involvement of the recurrent laryngeal nerve, which may present as hoarseness and dysphagia. Vocal cord paralysis or tracheal compression may also be present. Nodal metastases in the lateral neck are reported in 27% of patients at presentation, most often originating from tumors in the ipsilateral thyroid lobe.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Papillary Thyroid Carcinoma

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 561:

A 34-year-old male patient is referred to the clinic for biopsy of an anterior thyroid mass. His previous history is notable for a "tumor removed above my kidney." On physical exam, the clinician notices what appears to be a lump at the anatomic site of the patient's thyroid. The patient is also noted to be considerably tall and has long limbs in proportion to his torso. To guide the decision of the fine needle aspiration, the clinician performs a pre-procedure sonogram. Which one of the following sonographic findings of the thyroid mass is expected to be seen in this patient?

## Choices:

1. Microcalcifications within a nodule surrounded by normal parenchyma
2. Numerous regenerative nodules
3. Enlargement of the parathyroid glands
4. Diffuse enlargement of the thyroid gland

## Answer: 1 - Microcalcifications within a nodule surrounded by normal parenchyma

## Explanations:

- The American thyroid association (ATA) and the British thyroid association (BTA) have published guidelines that help with risk stratification based on sonographic features. The American college of radiology (ACR) also provided thyroid imaging, reporting, and data system (TI-RADS) classification with regards to fine-needle aspiration (FNA) recommendations based on sonographic features.
- Regardless of classification criteria used by a provider, the primary indication for a thyroid nodule FNA is to further investigate sonographic features suspicious for malignancy.
- Multiple endocrine neoplasias (MEN) 2b is a syndrome characterized by a marfanoid habitus, medullary thyroid cancer, and pheochromocytomas. Medullary thyroid cancer can frequently present with echogenic foci representative of microcalcifications.
- Graves disease frequently presents as diffuse enlargement of the thyroid gland. Regenerative nodules can be seen in different thyroid pathologies, including Graves disease and Hashimoto thyroiditis. MEN 1 syndrome is characterized by clinical manifestations of parathyroid hyperplasia, pituitary adenoma, and pancreatic malignancy.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Thyroid Nodule Biopsy

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## Question 562:

A 23-year-old man sees a clinician because he woke up on several occasions with severe headaches, anxiety, and heart palpitations. Vital signs are within normal limits. On physical examination, he has pectus excavatum, a high arched palate, bilateral pes cavus, and scoliosis. Which of the following laboratory measures would likely be elevated in this patient?

## Choices:

1. Calcium
2. Calcitonin
3. Phosphate
4. Insulin

## Answer: 2 - Calcitonin

## Explanations:

- This patient has a presentation similar to that of MEN type 2B. These patients have a classic triad of pheochromocytoma, medullary thyroid carcinoma, and marfanoid body habitus. Since he as 2 out of 3 signs of MEN 2B, there should be a suspicion for medullary thyroid carcinoma which produces calcitonin.
- His headaches, anxiety, and palpitations suggest excess catecholamines being released into the body because of pheochromocytoma. The examination findings are suggestive of marfanoid habitus
- MEN type 2 is a rare familial condition secondary to mutation of the RET proto-oncogene. Medullary thyroid carcinoma is a neoplasm of the medullary C cells hence the laboratory findings would be significant for elevated calcitonin levels.
- Elevated serum calcium is seen in patients with MEN type 1 or type 2A. An insulinoma is a pancreatic islet cell tumor that could be seen in a patient with MEN type 1. Elevated serum phosphate is not present in any of the MEN syndromes. is not present in any of the MEN syndromes. In patients with MEN-1 or MEN- 2A who have parathyroid adenomas, the serum phosphate will actually be low.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Multiple Endocrine Neoplasias Type 2

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## Question 563:

A 29-year-old female, after delivery of a baby, complains of an inability to lactate. Examination of the vitals reveals a blood pressure of 100/70 mmHg and a pulse rate of 110/min. Labs are remarkable for a blood glucose level of 55 mg/dL and a sodium level of 128 mEq/L. The patient's blood glucose level fails to increase, even with the infusion of glucose. She was completely asymptomatic before childbirth; however, the patient's labor was complicated by excessive blood loss. The patient is already being infused with intravenous fluids, but the blood pressure and pulse rate fail to normalize. Which of the following is the most appropriate treatment for this patient?

## Choices:

1. High dose dopamine
2. Hypertonic saline
3. Colloid infusion
4. Hormone replacement

## Answer: 4 - Hormone replacement

## Explanations:

- Sheehan syndrome, which is also called postpartum pituitary necrosis, refers to the necrosis of cells of the anterior pituitary gland following significant postpartum bleeding, hypovolemia, and shock.
- The acute presenting condition of Sheehan syndrome is usually evident when the mother of the newborn has difficulty with breastfeeding or cannot produce milk at all (agalactorrhea). However, many women are asymptomatic for months to years after childbirth. Women may report difficulties with menses after childbirth, and some may never have menses until Sheehan syndrome is diagnosed and treated. The acute form of Sheehan syndrome can be quite dangerous if not recognized and treated quickly after childbirth. The persistent hypotension and tachycardia can mimic hypovolemia and shock, but hyponatremia and persistent hypoglycemia can help to clinch the diagnosis of Sheehan syndrome. Symptoms of hypothyroidism may occur months after childbirth, and the patient may complain of fatigue, asthenia or weakness, hair loss, constipation, weight gain, problems with focusing or with their attention span, and cold intolerance. Lab values may reflect hypoglycemia, hyponatremia, and/or anemia. Treatment is with acute replacement of glucocorticoids but patients may require thyroid replacement or growth hormone.
- Evaluation of anterior pituitary function is done by obtaining blood when a high clinical suspicion is evident to diagnose Sheehan syndrome. Laboratory tests to order would include a CBC with diff, basic metabolic profile, thyroid function tests (TSH, FT3, FT4), FSH, LH, prolactin, estrogen, cortisol, and growth hormone. Finding a low basal hormone level along with a history and physical suggestive of Sheehan syndrome would help to make the diagnosis. Other laboratory tests that may occur with Sheehan syndrome include a normocytic/normochromic anemia, thrombocytopenia, and/or pancytopenia. Hyponatremia and hypoglycemia may also be present as well. Also, a magnetic resonance imaging (MRI) evaluation of the pituitary can be done to confirm the diagnosis. An empty sella is present in about 70% of patients. Acute Sheehan syndrome signs on an MRI may demonstrate acute central infarction without hemorrhage in an enlarged pituitary. As the disease progresses, the MRI may show pituitary gland atrophy and eventually a partial or empty sella.
- The basis for the treatment of Sheehan syndrome is the lifelong replacement of deficient hormones. Hypothyroidism can be treated with levothyroxine or liothyronine replacement. Cortisol deficiency can be treated by replacement with prednisone or hydrocortisone. Gonadotropin deficiency should be treated with estrogen if the uterus has been removed with a combination of estrogen and progesterone if a uterus is present. The growth hormone is probably the most common hormone that needs replacing, and the dosage must be individualized to the patient's need.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

# Sheehan Syndrome

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## Question 564:

A 36-year-old male is brought to the emergency department by his wife after he developed an episode of seizure at home 40 minutes ago. According to the patient's wife, her husband was watching television when he started complaining of a headache and palpitations. Suddenly he started having involuntary movements of his whole body and was sweating at the same time. The episode lasted for almost 4 minutes, after which the patient seemed very tired and semi-conscious. The patient works as a nurse in a big community hospital and has never had a similar episode before. A fingerstick glucose test reveals a blood sugar of 47 mg/dl. A bolus of 50% dextrose is given to the patient, after which the patient's condition improves drastically. Currently, his vital signs are within normal limits. Physical examination reveals a tired-looking man. Lab work reveals hemoglobin of 14 g/dl, HbA1c of 5.8%, serum c-peptide of 2.6 ng/ml, fast insulin of 3 IU/mL, and proinsulin concentration of 5 pmol/L. Oral hypoglycemic agent screening test comes out negative. A subsequent CT scan of the abdomen reveals a 2.5 cm tumor in the pancreas. The patient refuses surgery. Which of the following is the best drug to prevent further hypoglycemic episodes in this patient?

## Choices:

1. Diazoxide
2. Chlordiazepoxide
3. Diltiazem
4. Ondansetron

## Answer: 1 - Diazoxide

## Explanations:

- Insulinoma is the most common cause of hypoglycemia resulting from endogenous hyperinsulinism.
- Other less frequent causes of hypoglycemia include gastrinomas, vasoactive intestinal polypeptide tumors, and glucagonomas. Insulinoma should be treated with surgery but in this case, the patient is not willing to go through a surgery which would make medical therapy a necessity. The patient can be treated with diazoxide which is a thiazide diuretic that decreases insulin secretion. It should be given with caution as it can cause marked edema in some patients.
- The majority of insulinomas are benign lesions and can be cured with excision.
- The majority of patients with insulinoma present with diplopia, blurred vision, weakness or palpitations.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Insulinoma

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## Question 565:

A 16-year-old male presents to the office for delayed puberty. On physical exam, he is at Tanner stage 1, and testicular volume is 3mL. Stretched penile length is found to be less than 3.5 cm. He denies any changes in his ability to smell. History reveals that the patient was diagnosed with cryptorchidism at birth. Lab tests show decreased serum calcium. Which of the following are the most likely additional laboratory findings in this patient?

## Choices:

1. Decreased FSH; decreased LH; decreased testosterone; decreased thyroid stimulating hormone
2. Decreased FSH; decreased LH; decreased testosterone; normal thyroid stimulating hormone
3. Increased FSH; decreased LH; increased testosterone; decreased thyroid stimulating hormone
4. Decreased FSH; increased LH; decreased testosterone; normal thyroid stimulating hormone

## Answer: 2 - Decreased FSH; decreased LH; decreased testosterone; normal thyroid stimulating hormone

## Explanations:

- Isolated gonadotropin-releasing hormone (GnRH) deficiency (IGD) is defined by abnormally low levels of gonadotropins (LH and FSH) with concomitant low levels of circulating sex hormones.
- IGD is most commonly diagnosed in adolescents who present with absent or partial puberty. Biochemical testing shows low serum testosterone or estradiol that is secondary to complete or partial absence of GnRH-mediated release of LH and FSH but with otherwise normal anterior pituitary function.
- A common distinguishing feature between IGD and Kallman Syndrome, which also causes hypogonadotropic hypogonadism, is anosmia (lack of sense of smell).
- The management includes trying to induce and maintain secondary sex characteristics through increasing injection doses of testosterone or human chorionic gonadotropin (hCG) in males or estrogen and progestin in females. Decreased bone mass, secondary to low testosterone levels, is also a common feature in these patients who typically benefit from vitamin D and calcium supplementation.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Physiology, Testosterone

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## Question 566:

A 16-year-old female has concerns about excessive thirst and urination. The exam is normal. Urine HCG is negative. Laboratories show (meq/L): Na+ 143, K+ 4.1, Cl 108, HCO3 25, BUN 18 mg/dL, Blood glucose 102 mg/dL. Urine electrolytes (mmol/L): Na+ 30, K+ 30 Urine osmolality: 190 mmol/kg water. Fluid restriction causes a 7 percent drop in weight with resulting hypernatremia but no change in urine osmolality. Five units of subcutaneous arginine vasopressin do not change the urine electrolytes or osmolality. Which of the following is the most likely diagnosis?

## Choices:

1. Central diabetes insipidus
2. Surreptitious diuretic abuse
3. Nephrogenic diabetes insipidus
4. Salt losing nephropathy

## Answer: 3 - Nephrogenic diabetes insipidus

## Explanations:

- The patient's inability to concentrate urine despite fluid restriction indicated diabetes insipidus.
- The lack of response to arginine vasopressin places the defect at the level of the kidneys.
- Salt losing nephropathy would not result in hypernatremia.
- In adults, chronic lithium use can lead to nephrogenic diabetes insipidus.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Diabetes Insipidus

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## Question 567:

A 13-year-old boy is brought to the clinic with multiple swellings over both knees and left elbow for the past six months. He also has a history of chalky white discharge from the left knee swelling for the last three months. His blood counts are within normal limits. The serum phosphate level is 9 mg/dL. The plain x-rays of both knees and left elbow show multiple soft tissue calcific masses, while the joints appear normal. Which of the following additional organs is most likely to be involved in this patient's condition?

## Choices:

1. Teeth
2. Hair
3. Nails
4. Nose

## Answer: 1 - Teeth

## Explanations:

- The clinical symptoms and investigation reports point towards the diagnosis of hyperphosphatemic tumoral calcinosis. It chiefly manifests as multiple peri-articular swellings, which sometimes cause limitation in joint motion. Often these swellings start discharging chalky-white secretions containing hydroxyapatite.
- Teeth involvement is widely documented in this disease in the form of enamel changes, pulp calcification, shortening of roots, and thistle-shaped teeth.
- Teeth manifestations can be the first presentation of hyperphosphatemic tumoral calcinosis and therefore requires dentists to be vigilant for early identification of this disease.
- Nail, hair, and nose involvement has not been commonly described in this disease.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hyperphosphatemic Tumoral Calcinosis

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## Question 568:

A 50-year-old woman with a history of obesity presents to the office for a follow-up visit. At her last office visit 3 months ago, her hemoglobin A1c level was 7.5%. She also has a history of obstructive sleep apnea. She did not want to start any medication at the last visit and decided to try to diet and exercise. She has found an exercise routine that she thinks works for her, and her weight is down by 1.0 kg since the last visit. At this time, she now wants to try a diet that is high in lean meats, vegetables, and nuts and low in processed sugars, fats, and oils. Her hemoglobin A1c is 7.2%. Which of the following is the next best step in the management of this patient?

## Choices:

1. Initiate metformin therapy and nutritional counseling
2. Initiate a prescribed “Paleolithic diet” only
3. Start injectable insulin therapy
4. Start a D.A.S.H. diet only

## Answer: 1 - Initiate metformin therapy and nutritional counseling

## Explanations:

- This patient has diabetes mellitus with a hemoglobin A1c level over 6.5%, as described by the American Diabetes Association. In addition to lifestyle changes, including a healthy diet low in processed food, the patient should be started on a biguanide agent, in this case, metformin.
- Metformin is well tolerated generally, and has a low risk of hypoglycemia and is not associated with weight gain. At maximum tolerated therapeutic doses, metformin can decrease hemoglobin A1c levels by 1.5%.
- Injectable insulin is not appropriate at this time for this patient who has not started on diet and exercise regimens to improve insulin sensitivity. The Paleolithic diet and the D.A.S.H. diet are both similar in how much they reduce hemoglobin A1c, which is about 1%.
- The patient should be counseled to adhere to a diet that they can continue long term, and in general, avoid processed foods and foods high in glycemic index.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Paleolithic Diet

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## Question 569:

A 45-year-old woman undergoes an iodine-123 mIBG scan as a workup for hypertension that is unresponsive to medications to rule out the possibility of catecholamine secreting neoplasm. Her whole body images show mIBG uptake in salivary glands, heart, large bowel, liver, and urinary bladder. Which of the following best explains the mIBG uptake in the heart?

## Choices:

1. Left ventricular hypertrophy
2. Possible myocardial pathology responsible for hypertension
3. Myocardial inflammation
4. Physiological mIBG uptake in the myocardium

## Answer: 4 - Physiological mIBG uptake in the myocardium

## Explanations:

- Metaiodobenzylguanidine (mIBG) is a norepinephrine analog that is used in the diagnosis of sympathomedullary tumors.
- mIBG is normally taken up by the myocardium due to its sympathetic innervation.
- Physiological mIBG uptake is seen in the myocardium during I-123 or I-131 mIBG scintigraphy.
- One of the non-oncological applications of the mIBG scan is to study the sympathetic innervation of the heart in cardiac failure.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Nuclear Medicine Oncology Assessment, Protocols, And Interpretation

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## Question 570:

A 25-year-old man presents to the clinic for help losing weight. He has a BMI of 33 kg/m$^2$ has tried several diets without success. He has type 2 diabetes and is currently taking metformin. He has a family history of diabetes mellitus type 2 and coronary artery disease. He is found to have hyperinsulinemia and a high bone-mineral density. Which of the following genetic mutations is most likely to be present in this patient?

## Choices:

1. Melanocortin 4 receptor (MC4R) deficiency
2. Leptin receptor (LEPR) gene dysfunction
3. Proopiomelanocortin (POMC) deficiency
4. Mutations in the MRAP2 gene

## Answer: 1 - Melanocortin 4 receptor (MC4R) deficiency

## Explanations:

- The most common familial genetic defect which predisposes to obesity is melanocortin 4 receptor (MC4R) deficiency.
- Patients with this mutation have obesity onset at a young age, increased bone density, tall stature, and high levels of circulating insulin along with insulin resistance.
- MC4R mediates the anorectic effects of leptin, thus inducing leptin resistance.
- Proopiomelanocortin (POMC) deficiency and leptin receptor (LEPR) gene dysfunction both induce early-onset obesity. POMC deficiency induces adrenal crisis in neonatal life due to ACTH deficiency. LEPR mutation does not cause tall stature.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Obesity

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## Question 571:

A 26-year-old woman comes to the physician with complaints of not having menstrual cycles for the past five months. Her past medical history includes schizophrenia treated with quetiapine. She has a boyfriend and uses condoms for sex inconsistently. The patient has been stressed out recently after she caught her boyfriend cheating on her. She denies smoking or using drugs. The patient has never been pregnant nor has had an abortion. Currently, she is afebrile and hemodynamically stable. Physical examination is unremarkable. Lab reports reveal negative beta hCG test, prolactin levels id 222 ng/ml, TSH of 1.9 mU/L, free T4 of 1.5 ng/ml. Which of the following is the most appropriate next step in the management of this patient?

## Choices:

1. Stop quetiapine
2. MRI head
3. Initiate cabergoline
4. Initiate bromocriptine

## Answer: 2 - MRI head

## Explanations:

- Evaluation for pituitary hypersecretion when a patient is taking a medication known to raise the prolactin level is difficult. When the prolactin level is only mildly elevated (50 ng/mL [50 µg/L]), it may be reasonable to assume that hyperprolactinemia is a medication side effect.
- When significantly elevated (>100 ng/mL [100 µg/L]), either the medication needs to be withheld to further assess or a pituitary MRI obtained to evaluate for prolactinoma.
- Caution is warranted when discontinuation of an antipsychotic agent is being considered, and consultation with a psychiatrist is recommended before discontinuation. If the medication cannot be discontinued, a pituitary MRI is required to exclude the diagnosis of a pituitary tumor.
- Prolactinomas are treated with dopamine agonists. The two FDA-approved dopamine agonists are bromocriptine and cabergoline. Dopamine agonists typically decrease the size and hormone production of prolactinomas rapidly.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Pituitary Adenoma

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## Question 572:

A 15-year-old boy who was diagnosed with type 1 diabetes mellitus at age eight is being seen in follow-up. His hemoglobin A1c measurement has typically been 9% to 9.5% over the last year and his mean glucose has been in the low to mid 200s on glucose meter download. Today his glucose meter download demonstrates a mean glucose of 126 mg/dL with nearly all glucose levels being between 100-140 mg/dL except for two glucose in the 300s. On exam, he has few finger-poke sites visible on his fingertips. His hemoglobin A1c today is 10.8%. He asks for a refill of glucose meter control solution. What is the most likely explanation for the apparent difference in glycemia between home glucose monitoring and hemoglobin A1c measurement?

## Choices:

1. He recently improved his glucose control and his hemoglobin A1c has not had a chance to "catch up"
2. He is using glucose meter control solution to make it appear his glucose is in the target range. The two blood glucose levels in the 300s are likely his own glucose
3. Congenital abnormality in glycosylation of his hemoglobin
4. His glucose meter is not accurate and should be replaced

## Answer: 2 - He is using glucose meter control solution to make it appear his glucose is in the target range. The two blood glucose levels in the 300s are likely his own glucose

## Explanations:

- There is a strong emphasis on achieving "in-target" glucose values. When children, adolescents, or adults with diabetes feel discouraged when they see out-of-range glucose values, they may feel like not checking glucose levels as often, may alter glucose records, or seek out ways to make glucose values appear "in-target."
- Some patients who feel defeated by out-of-range glucose may stop checking levels. Providers should acknowledge this important psychological defense mechanism of protecting yourself from repeated negative feedback, discuss it with patients, and emphasize that they are "more important than a number." Discuss that there are no "good" and "bad" blood sugars; rather they are just numbers that give information about how to best care for diabetes. In a way, all numbers are good numbers.
- A number of mechanisms may be employed to disguise true glucose values. Some may include not bringing the glucose meter to the appointment, erasing glucose meter memory, bringing a logbook of falsified glucose values, checking some else's blood glucose, bringing a family member's glucose meter, and using glucose meter control solution, among others.
- Attention to psychological care in diabetes is important for all people with diabetes. This is reinforced in the American Diabetes Association Standards of Medical Care in Diabetes which is updated annually.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Diabetes Mellitus Type 1 In Children

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## Question 573: A clinical research group decides to look at the nutritional impact of small and large intestine removal in Crohn disease patients, replacing all nutritional therapy with total paternal nutrition. Which of the following findings is least expected in these patients?

## Choices:

1. Increased rates of atherosclerotic events
2. Increased synthesis of Apo-A1 by the liver
3. Decreased activation of LCAT by Apo-A1
4. Increased clearance of Apo-A1 by the kidney

## Answer: 4 - Increased clearance of Apo-A1 by the kidney

## Explanations:

- Apo-A1 is the main structural protein of HDL. Apo-A1 is required to make HDL.
- 70% of Apo-A1 is made by the liver and 30% is made by the intestines. By removing the intestines, less Apo-A1 is produced and thus HDL levels go down. The liver would likely compensate by increasing Apo-A1production. However, it is likely that HDL levels would be lower.
- Lower HDL levels would likely lead to increased rates of atherosclerotic events due to decreased reverse cholesterol transport and the formation of plaques. Additionally, Apo-A1 is required to activate LCAT. With lower levels of Apo-A1, LCAT would be activated less.
- There would be decreased clearance of Apo-A1 by the kidney because there would be less Apo-A1 produced after the removal of the intestines.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Biochemistry, High Density Lipoprotein

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## Question 574:

A 38-year-old woman presents to the clinic with a complaint of left shoulder pain for six months. She denies trauma or heavy lifting. She has a past medical history of pituitary tumor, and her father died of pancreatic cancer at age 45. Shoulder XR revealed distal clavicular thinning. On laboratory analysis, serum calcium level was 11.6 mg/dl, serum albumin level was 5.1 g/dl, serum alkaline phosphatase level was 860 IU/l, and serum vitamin D level was 35 ng/mL. Which one of the following is the pathogenesis of the patient's bone condition?

## Choices:

1. Thyroid hormone stimulates bone resorption
2. Excess cortisol level causes decreased intestinal calcium absorption, decreased bone formation, increased bone resorption, and decreased renal calcium reabsorption
3. Parathyroid hormone activates osteoclast cells result in bone resorption with the destruction
4. Estrogen deficiency causes bone resorption

## Answer: 3 - Parathyroid hormone activates osteoclast cells result in bone resorption with the destruction

## Explanations:

- Osteitis fibrosa cystica (OFC), a skeletal disorder caused by an overproduction of parathyroid hormone (PTH) from the overactive parathyroid gland(s), is characterized by the occurrence of bone pain associated with the finding of specific radiographic changes such as increased subperiosteal bone resorption in the distal third of the radius and middle phalanges, distal clavicular thinning, “salt and pepper” skull, bone cysts, and brown tumors in long bones and generalized osteopenia are seen in 5% of cases.
- PTH stimulates the activity of osteoclast cells that breakdown bone. The overactivity of the parathyroid glands called primary hyperparathyroidism (PHP) can be triggered by a parathyroid adenoma, hereditary factors, parathyroid carcinoma, or renal osteodystrophy.
- Hereditary diseases that caused OFC include familial hyperparathyroidism, multiple endocrine neoplasia type 1 (MEN Type 1) and type 2a ( MEN Type 2a), and hyperparathyroidism-jaw tumor syndrome.
- MEN Type 1 and type 2a are an autosomal dominant disorder and the most common hereditary form of hyperparathyroidism, affecting about 95% of genetic cases of OFC, and also tends to affect younger patients than other forms. MEN type 1 = Parathyroid tumors, pancreatic tumors, and pituitary tumors. MEN type 2a = Medullary thyroid cancers (MTC), pheochromocytoma, and parathyroid tumors.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Osteitis Fibrosa Cystica

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## Question 575: What differentiates cerebral salt wasting syndrome from syndrome of inappropriate secretion of antidiuretic of hormone (SIADH)?

## Choices:

1. Serum sodium level
2. Urine sodium level
3. Volume status
4. Response to desmopressin

## Answer: 3 - Volume status

## Explanations:

- Both cerebral salt wasting syndrome and syndrome of inappropriate secretion of antidiuretic of hormone (SIADH) present with hyponatremia and increased urine sodium excretion.
- In cerebral salt wasting, the patient is hypovolemic.
- In SIADH, the patient is hypervolemic to euvolemic.
- The management strategies for cerebral salt wasting syndrome and SIADH are different, so it is important to distinguish between the two.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Cerebral Salt Wasting Syndrome

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## Question 576:

A 17-year-old male has an acute onset of muscle cramps of both hands and perioral tingling. Exam shows an anxious man with elevated respiratory and ABG showing increased pH and decreased bicarbonate and PCO2. Which of the following is most likely decreased in the serum?

## Choices:

1. Sodium
2. Calcium
3. Oxygen
4. Potassium

## Answer: 2 - Calcium

## Explanations:

- The patient has hypocalcemia that can be caused by hypoparathyroidism or by non-parathyroid causes.
- These include hypomagnesemia, vitamin D deficiency, chronic renal failure, hyperventilation, and hypoalbuminemia.
- Hypocalcemia can cause tetany or paresthesias of the lips, hands, and/or feet.
- This patient hyperventilated, causing respiratory alkalosis that in turn increases binding of calcium to negatively charged albumin.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hypocalcemia

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## Question 577:

A 65-year-old is presents to the gastroenterology clinic with persistent diarrhea. The patient has had multiple episodes of loose, tea-colored stools for the past 12 months. He has to get up twice at night due to his symptoms. He reports an 11 kg weight loss during the past year. He has a history of acromegaly, for which he underwent trans-sphenoidal resection of pituitary 30 years back. His examination reveals a blood pressure of 100/60 mmHg, a pulse of 97 beats per minute, a respiratory rate of 14 breaths per minute, and a temperature of 98 F. His physical examination reveals conjunctival pallor, and temporalis wasting. His gastrointestinal, cardiovascular, respiratory, and neurologic examinations are unremarkable. His investigations reveal a WBC count of 5,000 per microL, a hemoglobin of 11 gm/dl, a platelet count 220,000 per microL, serum ALT 65 IU/L, serum AST 70 IU/L, serum albumin 3.0 gm/dl, serum creatinine 1.1 mg /dl, serum sodium 140 meq/l , serum potassium 3.0 meq/l , serum chloride 110 meq/l, serum bicarbonate 18 meq/l, blood sugar random 140 mg/dl, serum CRP 2.5 mg/l, and serum amylase 70 IU/L. His stool examination is negative for ova or cysts and shows no growth on culture. The stool osmolar gap is calculated to be 40 mOsm/kg. An upper GI endoscopy reveals no focal mucosal lesion, and the gastric pH is found to be 6.5. A contrast-enhanced CT scan reveals the presence of a 5 cm mass in the body of the pancreas with few lesions in the liver and mesenteric lymph nodes. A CT guided biopsy of the pancreatic mass is obtained. What will the histological analysis of the biopsy reveal?

## Choices:

1. Poorly differentiated glands with perineural invasion
2. Irregular interlobular fibrosis with loss of acinar cells
3. Islet cells depletion with hyaline deposits
4. Small cells with granular cytoplasm and stippled chromatin

## Answer: 4 - Small cells with granular cytoplasm and stippled chromatin

## Explanations:

- The patient presents with a history of chronic diarrhea, along with investigations showing secretory diarrhea with hypokalemia and achlorhydria. This, along with a history of pituitary adenoma and radiological finding of a metastatic pancreatic mass, make the likely diagnosis as VIPoma, possibly in the presence of MEN 1 syndrome. VIPomas are rare neuroendocrine tumors.
- Neuroendocrine tumors are caused by cells that appear as mononuclear, round blue cells which have granular cytoplasm and a stippled chromatin. The classical appearance is of ‘salt and pepper’ chromatin.
- The cells are derived from neuroendocrine cells and will show neuron-specific staining patterns. Staining for synaptophysin is often used.
- The tumor may have spread to the liver, mesenteric nodes, and lymph nodes, making surgical resection impossible. Pancreatic adenocarcinoma is derived from atypical glands but does not present with watery diarrhea and achlorhydria. Chronic pancreatitis causes osmotic diarrhea and irregular fibrosis of the gland. Long-standing type 2 diabetes causes beta-cell exhaustion and amyloid deposition.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### ViPoma

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## Question 578: A 48-year-old woman presents to the clinic with right wrist pain after a mechanical fall from standing. Motor and sensory exams are within normal limits, and the patient's fingers are warm and well perfused. Radiographs demonstrate an isolated distal radius fracture. Closed reduction is performed in the patient is placed into a splint. Postreduction x-rays demonstrate acceptable alignment of the fracture fragment. Other than the orthopedic follow-up, which of the following is the next best step in the management of this patient?

## Choices:

1. PTH level
2. Dual-energy bone densitometry
3. Neuropathy evaluation
4. Cognitive assessment

## Answer: 2 - Dual-energy bone densitometry

## Explanations:

- Distal radius fractures are one of the most common fractures and typically have a bimodal distribution, predominantly affecting the young and the old. Fractures outside of these age ranges are not typical and require further evaluation.
- The most common secondary cause of distal radius fracture is silent osteoporosis. As such, this patient should have an initial workup, including dual-energy bone densitometry.
- Patients who are at increased risk of falling also have increased risks of sustaining a distal radius fracture. As such, patients with difficulty ambulating should be evaluated for assistive devices to reduce the risk of falls.
- Parathyroid evaluation may be warranted to evaluate for secondary causes of osteoporosis. However, the diagnosis of osteoporosis should be made first by dual-energy bone densitometry assessment. Dementia substantially increases the risk of sustaining a distal radius fracture and is usually comorbid with either osteopenia or osteoporosis.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Distal Radius Fractures

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## Question 579: A 46-year-old woman visited the hospital with symptoms of nasal obstruction, sudden involuntary movement of the body, and one-sided headache. She has a history of type-2 diabetes for 13 yrs on medication. Laboratory findings showed WBCs and eosinophils within normal limits, serum glucose level 118mg/dl and HbA1c 6.5%. Endoscopic examination revealed a black necrotic mass, discharge mixed with blood, and bony erosion. What is the most likely pathogenesis of this disease?

## Choices:

1. Hematogenous spread
2. Vascular endothelial invasion
3. Invasion and spread through neuron axonal transport
4. Lymphatic spread to the central nervous system.

## Answer: 2 - Vascular endothelial invasion

## Explanations:

- Humid nasal cavity and sinuses make initial implantation favorable for fungal spores.
- Necrosed tissue is the nidus for the growth and spread of fungi.
- Invasion and erosion of bone lead to bone destruction that creates a direct path of transmission of fungi.
- Rapid progression of rhinocerebral mucormycosis is due to vascular endothelial invasion and thrombosis, which leads to ischemia and tissue necrosis.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Rhinocerebral Mucormycosis

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## Question 580: A 16-year-old girl with a BMI of 34 kg/m2 presents to the clinic for follow-up. She takes metformin for type 2 diabetes mellitus. She also has PCOS (polycystic ovarian syndrome) and obstructive sleep apnea. Her weight has not decreased despite getting dietary interventions, physical activity, and behavioral therapy. Which of the following is the next best step in the management of this patient?

## Choices:

1. Liraglutide
2. Bupropion/naltrexone
3. Phentermine/topiramate
4. Lorcaserin

## Answer: 1 - Liraglutide

## Explanations:

- Orlistat and liraglutide are the only FDA-approved medication for use in adolescents.
- Orlistat is poorly tolerated due to gastrointestinal side effects and frequent dosing.
- Surgical procedures like gastric bypass have not been studied sufficiently in children to advise their use.
- Dietary management, physical activity, and behavioral intervention (family-based) are the cornerstone for obesity management in adolescents.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Obesity Effects On Child Health

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## Question 581:

A 56-year-old man comes to the clinic with pain in his left knee for the last two days. It is not associated with fever, chills, or night sweats. He does not recall a recent trauma or travel history. He reveals constipation, increased urination, and depression in the past six months. On further inquiry, he reports a few episodes of kidney stones for which he got pharmacological treatment. He does not take any regular medications and does not smoke or drink. His temperature is 99 F, and blood pressure is 135/80 mmHg. Physical examination shows mild swelling with warmth and erythema and tenderness of the left knee. The rest of the examination is unremarkable. Which of the following is most likely to be seen on the microscopic evaluation of the synovial fluid?

## Choices:

1. Needle-shaped crystals
2. Neutrophils filled with gram-positive cocci
3. Rod-shaped crystals
4. Hemorrhagic effusion

## Answer: 3 - Rod-shaped crystals

## Explanations:

- Symptomatic hypercalcemia in this patient (fatigue, constipation, calcium stones) suggests primary hyperparathyroidism. Hyperparathyroidism clinically presents as "bone, stones, groans, and moans." This represents fractures, calcium kidney stones, abdominal pain, and psychiatric problems.
- Pseudogout is acute inflammatory arthritis caused by calcium pyrophosphate dihydrate crystals in the joint space and is a common complication of hyperparathyroidism with chronic hypercalcemia.
- Microscopy shows rhomboid-shaped, positively birefringent crystals of calcium pyrophosphate.
- X-ray reveals chondrocalcinosis of the joint.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Primary Hyperparathyroidism

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## Question 582:

A 27-year-old male with a past medical history significant for asthma and type I diabetes mellitus presents to the emergency department with right lower quadrant pain and fever. Physical exam and imaging are consistent with appendicitis, and the patient is admitted to the hospital. The patient successfully undergoes an appendectomy without complications. On postoperative day two, the patient is found to be lethargic. According to the nursing staff, the patient was anxious throughout the afternoon and progressively became more confused. He is unable to follow commands. The physical exam reveals tachycardia and diaphoresis. There are no ketones on urinalysis. The resident physician reviews the chart and notices that the patient's home medication doses were not adjusted for the hospital setting. The patient's condition improves after the administration of an intramuscular drug. Which of the following is an effect of the drug that the patient received?

## Choices:

1. Glycogen catabolism
2. Fatty acid anabolism
3. Translocation of GLUT4 (glucose transporter 4) receptors to the cell membrane
4. Stimulation of pancreatic beta-cells

## Answer: 1 - Glycogen catabolism

## Explanations:

- This patient has a history of diabetes type I and is likely dependent on insulin. When hospitalized, home insulin doses are decreased to account for environmental changes (patients usually eat less food in the hospital) as patients with diabetes mellitus are at high-risk for hypoglycemia. This patient's symptoms of confusion, tachycardia, and diaphoresis are consistent with hypoglycemia, which should respond to an increase in plasma glucose (in this case achieved by intramuscular glucagon).
- This patient's hypoglycemia was likely caused by a decreased in oral intake of glucose (common in the hospital setting) but without any adjustment of his insulin dose. This imbalance will result in a decrease in glucose levels below the lower limit of normal. Once this occurs, the patient will begin to exhibit signs and symptoms of hypoglycemia such as nausea, tachycardia, diaphoresis, and central nervous system changes.
- The symptoms of hypoglycemia can be categorized as neuroglycopenic and neurogenic. Neuroglycopenic symptoms that this patient exhibited include behavioral changes and fatigue. Neurogenic symptoms that this patient exhibited include anxiety and diaphoresis.
- Patients with hypoglycemia will improve when their blood glucose levels increase which can be achieved in the clinical setting with either exogenous glucose (IV or PO) or with the administration of a glucogenic hormone such as glucagon. Glucagon increases plasma glucose by increasing gluconeogenesis and glycogenolysis.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Physiology, Glucose

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## Question 583:

A 44-year-old patient presents to her endocrinologist's office for a follow-up appointment. Her medical history includes hypertension, GERD, Myasthenia Gravis, and pericarditis. She follows with endocrinology for a 2-year history of diabetes mellitus requiring exogenous insulin. She would like to be insulin-dependent and asks her endocrinologist about Islet cell transplantation. What in the patient's history disqualifies her as a candidate for the procedure?

## Choices:

1. Myasthenia Gravis
2. History of cardiac disease
3. Autoimmune disease
4. Age of onset for diabetes

## Answer: 4 - Age of onset for diabetes

## Explanations:

- One of the qualifications is that the onset of diabetes must be before the age of 40.
- Any patient considering islet cell transplantation needs to be insulin-dependent for > 5 years, this patient has only been insulin-dependent for 2.
- Patients need a detailed history of their diabetes, including the age of onset, duration of disease, and multiple unrecognized episodes of hypoglycemia occurring within a certain time frame.
- Autoimmune conditions are not a contraindication to islet cell transplantation.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Islets Transplantation

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## Question 584:

A 3-year-old boy is brought to the clinic with complaints of his failure to thrive. Although he can walk with help, he cannot climb up the stairs, and his gait is not steady. The parents report that his stools are often bulky, malodorous, and poorly formed. Further evaluation reveals deranged lipid profiles and increased ALT/AST. On physical examination, a distended abdomen with hepatomegaly is noted. A genetic defect in protein synthesis is suspected. Which of the following diseases also most commonly presents with hepatomegaly due to a defect similar to the patient's disease?

## Choices:

1. Marasmus
2. Kwashiorkor
3. Cystic fibrosis
4. Dysbetalipoproteinemia

## Answer: 2 - Kwashiorkor

## Explanations:

- Abetalipoproteinemia involves defective Apo B-100 and Apo B-48 synthesis, with the former being required by the liver for releasing fat particles into the blood.
- Absence of/ defect in Apo B-100 leads to fat accumulation in the liver and causing hepatomegaly.
- While in abetalipoproteinemia Apo B-100 is dysfunctional, in Kwashiorkor it is deficient or absent.
- Failure to thrive and chronic diarrhea in a child makes one think of cystic fibrosis. However, a complete examination with relevant investigations is indispensable to rule out other causes. In cystic fibrosis, it is the pancreas that may be involved, instead of the liver.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Abetalipoproteinemia

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## Question 585:

In an epidemiologic study of individuals whose BMI is greater than 35 $kg/m^2$, data on lifestyle and disease patterns are collected. Investigators observed that a subset of obese individuals has a consistently high caloric intake because they lack a feeling of satiety when eating. These individuals have diminished responsiveness of a hypothalamic receptor to a substance elaborated by adipocytes. Which of the following receptors is most likely to be affected in these individuals?

## Choices:

1. Adenosine
2. Glucagon
3. Leptin
4. LDL

## Answer: 3 - Leptin

## Explanations:

- Leptin signaling from adipocytes that have taken up an adequate supply of fatty acids ordinarily feeds back to the hypothalamus, which decreases the synthesis of neuropeptide Y.
- This neurotransmitter acts as an appetite stimulant, and a decrease in its synthesis causes satiety.
- An increasing blood glucose level results in an increased release of insulin to promote glucose uptake into connective tissues, muscle, and adipose tissue. VLDL from the liver is transformed in adipose tissue and muscle to LDL, which is taken up by various cells with LDL receptors that need cholesterol for membrane synthesis.
- Adenosine is a nucleoside used to treat cardiac dysrhythmias. Glucagon opposes insulin by increasing hepatic glycogen storage.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Genetics and Obesity

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## Question 586:

A 16 year-old-boy is brought to the emergency department (ED) after he suddenly developed fever, vomiting, headache, decreased ability to concentrate, and myalgia. He also has neck stiffness and rashes in the trunk and legs. His vital signs show a temperature of 101.8 F, pulse rate 102/min, respiratory rate 16/min, and blood pressure 110/80 mmHg. On examination, Brudzinski and Kernig signs are positive, and petechiae are present over the trunk and legs. Lumbar puncture is performed. and normal saline and appropriate antibiotics are started. A few hours later, the petechiae coalesce into larger ecchymotic lesions, and his blood pressure drops to 80/40 mmHg. Intravenous vasopressor is started to treat low blood pressure. Coagulation parameters reveal prothrombin time of 18 seconds, activated partial thromboplastin time of 48 seconds, and fibrinogen level of 70 mg/dl. The blood pressure is unresponsive to the vasopressor, and he passes away in the ED. Which of the following lab parameters is most suggestive of the patient's most likely cause of death?

## Choices:

1. Hypernatremia, hypokalemia and metabolic alkalosis
2. Hyponatremia, hyperkalemia and metabolic acidosis
3. Hyponatremia, hyperkalemia and metabolic alkalosis
4. Hyponatremia, hypokalemia and metabolic acidosis

## Answer: 2 - Hyponatremia, hyperkalemia and metabolic acidosis

## Explanations:

- The patient most likely had meningococcemia and disseminated intravascular coagulation (DIC). In this setting, adrenal gland hemorrhage leading to adrenal insufficiency is the most likely explanation.
- The lab parameters suggesting adrenal insufficiency due to Waterhouse-Friderichsen syndrome (WFS) include hyponatremia, hyperkalemia, and metabolic acidosis.
- Mineralocorticoid (aldosterone) deficiency leads to hyponatremia, hyperkalemia and metabolic acidosis.
- Hyponatremia also occurs due to SIADH caused by cortisol deficiency.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Waterhouse-Friderichsen Syndrome

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## Question 587:

A 38-year-old man presents to the clinic due to burning epigastric pain and diarrhea for the last 5 months. He has foul-smelling stools that are difficult to flush. The patient mentions he has lost 8 kg in the previous 2 months. The patient has tried over the counter antacids and proton pump inhibitors with no success. Stool testing is positive for occult blood as well as stool fat. The patient mentions that his brother was diagnosed with a pituitary tumor and that his sister has recurrent abdominal and bone pain and was diagnosed with an abnormality in her parathyroid glands. Which of the following is the most likely diagnosis?

## Choices:

1. Pancreatic adenocarcinoma
2. Primary biliary cirrhosis
3. Zollinger-Ellison disease
4. Chronic pancreatitis

## Answer: 3 - Zollinger-Ellison disease

## Explanations:

- A family history of pituitary and parathyroid pathologies in a patient suffering from what seems to be a pancreatic pathology is consistent with MEN1 syndrome. This patient most likely has Zollinger-Ellison syndrome, which is due to a gastrin-producing tumor. Uncontrolled gastrin release causes excessive gastric acid production.
- Multiple duodenal and jejunal ulcers are common and are often refractory to standard acid-reducing medication. Gastrinomas can cause fat malabsorption due to pancreatic enzyme inactivation from in the excess acid in the duodenum.
- The diagnosis of a gastrinoma is suggested by markedly elevated gastrin levels and a low gastric pH.
- The patients with a confirmed gastrinoma should be screened for multiple endocrine neoplasia 1 with investigations for parathyroid hormone levels, ionized calcium levels, and prolactin levels.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Gastrinoma

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## Question 588: A 65-year-old woman with a history of type 2 diabetes presents to the clinic to discuss the medical management of her obesity. She has been taking the maximum dose of metformin for diabetes. Laboratory investigations reveal hemoglobin A1c of 9.4%. She is started on a long-term use injectable antiobesity medication approved by the FDA. Which of the following is the strongest possible contraindication for this medication in this patient?

## Choices:

1. Depression
2. Nephrolithiasis
3. Gastroparesis
4. Papillary thyroid carcinoma

## Answer: 3 - Gastroparesis

## Explanations:

- It is important to inquire about the history of severe gastroparesis in patients with obesity and diabetes before starting treatment with liraglutide.
- Liraglutide is a GLP-1 analog, and patients with severe gastrointestinal diseases such as gastroparesis and inflammatory bowel disease should avoid GLP-1 analogs.
- Given the mechanism of GLP-1 analogs, liraglutide can slow gastric motility and slow gastric emptying.
- High-dose liraglutide long-term use injectable antiobesity medication is FDA approved as a pharmacologic treatment for obesity or can be prescribed to overweight patients with comorbidities. Medullary thyroid carcinoma, not papillary thyroid carcinoma, is a contraindication to liraglutide use.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Glucagon-like Peptide-1 Receptor Agonists

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## Question 589: A 25-year-old man presents with severe movement restriction of both shoulders and elbows. He gives a history of episodic swelling of both upper limbs for the past six years and a sudden increase in the stiffness of both shoulders and elbows after a recent episode of trauma. Which of the following is the most appropriate treatment?

## Choices:

1. Palvarotene
2. Indomethacin
3. Sevelamer
4. Acetazolamide

## Answer: 1 - Palvarotene

## Explanations:

- The clinical vignette suggests a case of fibrodysplasia ossificans progressiva (FOP).
- Palvarotene is a retinoic acid receptor gamma agonist which has been used for patients with FOP.
- Palvarotene inhibits heterotopic ossification and has been reported to maintain limb growth and mobility in animal studies.
- Indomethacin is a nonsteroidal anti-inflammatory drug used for secondary prevention of myositis ossificans. Sevelamer and acetazolamide are used for hyperphosphatemic tumoral calcinosis.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Fibrodysplasia Ossificans Progressiva

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## Question 590:

An 8-year-old child was brought up to the clinic regarding his stunted height compared to his peers. His parents are about 6 feet tall. His body is in proportion and has normal weight for age, androgen level, and IGF-1 level in blood. Using this information only, what would one prescribe as a provider?

## Choices:

1. Gonadotropin-releasing hormone analogs treatment
2. Recombinant human insulin-like growth factor- 1
3. Nutritional supplements
4. Metformin

## Answer: 1 - Gonadotropin-releasing hormone analogs treatment

## Explanations:

- Stature is determined by various factors, including environmental, genetic, and nutritional. Other causes of short stature include deficiency of numerous hormones, congenital disorders, etc. If the person has the genetic potential of attaining tall height with a normal nutritional level, the hormonal cause is diagnosed. Various hormonal treatments are available today to treat the underlying hormonal condition giving rise to short stature, which includes gonadotropin-releasing hormone analogs (GnRHa), aromatase inhibitors, recombinant human insulin-like growth factor- 1 (RhIGF-1), low-dose androgen therapy, recombinant human growth hormone (rhGH), etc.
- The major medical cause of short stature is growth hormone deficiency (GHD). This may be categorized as an endocrine disorder. Human growth is regulated by growth hormones. The growth hormone-releasing hormone (GHRH) released by the hypothalamus stimulates the production and secretion of growth hormone (GH) from the anterior pituitary.
- The administration of GnRHa suppresses gonadotropin, and gonadal steroid secretion allows for increased time for the development of menarche and will lead to delayed bone maturation and fusion of the epiphyseal plates. GnRHa also influences growth velocity.
- Recombinant human insulin-like growth factor- 1 (RhIGF-1) is prescribed in case of deficiency of insulin-like growth factor- 1 (RhIGF-1), whereas metformin has been used to treat insulin sensitivity in the fetus. However, in this case, IGF-1 levels were normal; therefore, RhIGF-1 treatment is not prescribed. On the other hand, the child is 8 years old, and the prescription of metformin is not applicable as it is a maternal supplement for fetal deficiency. Another important cause for short stature, especially in under-developed countries, is malnutrition. The treatment for this underlying cause is the prescription of nutritional supplements and maintenance of nutritional status to prevent the development of malnutrition. It does not, however, lead to the treatment of previous developmental delays. In this case, the weight for age was normal, precluding the need for nutritional supplements.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Short Stature

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## Question 591:

A six-year-old male presents with progressive stiffness of his upper torso and shoulders with increasing disability for the past two years. On the basis of his history and peculiar physical examination findings, a rare metabolic and genetic disorder of abnormally increased signaling in the bone morphogenetic protein pathway is diagnosed. Which among the following is a characteristic physical examination finding seen in the foot in these patients?

## Choices:

1. Congenital hallux valgus with macrodactyly
2. Flatfeet
3. Calcaneovalgus deformity
4. Clubfoot

## Answer: 1 - Congenital hallux valgus with macrodactyly

## Explanations:

- The clinical vignette suggests a diagnosis of fibrodysplasia ossificans progressiva (FOP).
- The presence of congenital hallux valgus with macrodactyly is a characteristic foot pathology seen in these patients.
- Some other anomalies seen in such patients include clinodactyly, deformities of the thumbs, and a short femoral neck.
- Flatfeet, clubfoot, and calcaneovalgus deformities are not commonly seen in patients with FOP.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Fibrodysplasia Ossificans Progressiva

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## Question 592:

A 25-year-old woman is referred for evaluation of irregular menstruation, facial hair, and infertility. She has been unsuccessfully trying to get pregnant for the last year. She does not have any other medical conditions. She does not take any other medication apart from a multivitamin. Physical examination shows terminal hair on the chin and upper part of the neck but otherwise normal. She does not have any allergies, and family history is negative, except for type 2 diabetes in her grandmother. She has been following with her gynecologist and had an evaluation for infertility. All labs are normal except 17 hydroxy progesterone 250. The total cortisol at 8 am is 18 mcg/dL (5-23 mcg/dL). What is the next best test to diagnose the underlying pathology?

## Choices:

1. Baseline, 30 and 60 minute 17 hydroxyprogesterone after 250 mcg cosyntropin
2. Baseline, 30 and 60-minute total cortisol after 1 mcg cosyntropin
3. Ultrasound of bilateral adrenals
4. Ultrasound of bilateral ovaries

## Answer: 1 - Baseline, 30 and 60 minute 17 hydroxyprogesterone after 250 mcg cosyntropin

## Explanations:

- Young female patients with hirsutism should be evaluated for Non-Classic Congenital Adrenal Hyperplasia (NCCAH). A high dose cosyntropin stimulation test (CST) is also used as a confirmatory test to diagnose Non-Classic Congenital Adrenal Hyperplasia (NCCAH). NCCAH is characterized by the partial activity of enzyme 21 Hydroxylase 21 OH. This leads to the accumulation of 17 hydroxy-progesterone (17OHP) and androgens.
- The symptoms are much milder than classic congenital hyperplasia (CAH) and are usually limited to menstrual irregularity and symptoms of hyperandrogenism like hirsutism and acne. Cortisol levels are usually normal. This can be diagnosed if baseline 17 OHP is greater than 240 nmol/L.
- High dose CST can be used for confirmation if levels are lower than 240nmol/L. During the test, 17 OHP levels are measured at baseline and 60 min after IV/IM administration of 250 mcg Cosyntropin. The stimulation of OHP to more than 30 nmol/L confirms the diagnosis of NCCAH.
- NCCAH is not associated with cortisol deficiency.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Adrenocorticotropic Hormone Test

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## Question 593:

A 58-year-old female is admitted to the hospital with deep vein thrombosis of the left leg. On further questioning, she admitted to a weight loss of about 25 pounds (11.3 kg) over the past six months. She has noted a painful and pruritic rash around her genitalia. She has not seen her primary care physician over the past several years. Her blood work in the hospital shows fasting blood sugar of 156 mg/dL ( 65 - 95), HbA1c 7.9% ( 4.8- 5.6%), hemoglobin 10.1 g/ dL, creatinine 0.8 mg/dL ( 0.76-1.27). Her physical examination is remarkable for swelling of the left lower extremity. She is noted to have dermatitis around her mouth and perigenital regions. Her fasting glucagon levels are elevated at 848 pg/ ml ( normal 150). A clinical diagnosis of glucagonoma syndrome is made. Which of the following imaging should be ordered next in her case?

## Choices:

1. Contrast-enhanced MRI of the abdomen
2. Helical multiphasic contrast-enhanced CT scan of abdomen
3. Somatostatin receptor scintigraphy ( Octreoscan)
4. Functional PET scan with DOTA peptides

## Answer: 2 - Helical multiphasic contrast-enhanced CT scan of abdomen

## Explanations:

- Tumor localization is usually started with a helical multiphasic contrast-enhanced CT scan.
- The sensitivity of a multiphasic CT scan is high at greater than 80% for detecting intrapancreatic neuroendocrine tumors.
- Contrast-enhanced MRI is performed in the case of indeterminate lesions. They have higher sensitivity for detecting liver metastasis.
- Somatostatin receptor scintigraphy ( Octreoscan), as well as functional PET imaging, are helpful in the staging of the tumor. Most patients with glucagonoma present in the fifth to the sixth decade of life with similar incidence in males and females.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Glucagonoma Syndrome

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## Question 594:

A 26 years old woman with a past medical history of cardiac myxoma, eyelid myxoma, ovarian cyst, and blue nevi, was referred for evaluation of unwanted facial hair, acne, and irregular menses associated with 35 Lb weight gain in the past two years. The patient was adopted at birth (unknown family medical history). On physical examination, blood pressure was 160/101mmHg, pulse rate was 74 beats/minute, and BMI was 32kg/m2. She has coarse terminal hairs with acne on the chin, upper lip, and sides of her face, ovoid bluish-black-colored marks, and wide purple stretch marks on her abdomen. Laboratory results revealed ACTH 7 pg/ml (5-50 pg/ml), cortisol 45 ug/dl (10-20 ug/dl), 24 hours urine cortisol 360 ug/24h (4-50 ug/24h), hemoglobin A1C 6.7%. CT of the abdomen showed bilateral small pigmented nodules 1 cm. The patient underwent bilateral adrenalectomy, and pathology showed primary pigmented nodular adrenocortical disease. Given the above presentation, she was referred for genetic analysis, and the suspected genetic disease was confirmed. Postoperatively, her menstrual periods became regular. Given her desire to become pregnant, what is the probability of her child being affected by this genetic disease?

## Choices:

1. 0 percent
2. 25 percent
3. 50 percent
4. 100 present

## Answer: 3 - 50 percent

## Explanations:

- The patient described in the above question has a rare genetic disorder called "Carney complex." It is an autosomal dominant syndrome. A child with an affected parent has a 50 percent chance of the disease.
- Patients with Carney complex have myxomas of the heart and skin, lentiginosis (hyperpigmentation of the skin), blue nevi, and endocrine overactivity. The patient described above had Cushing syndrome explained by weight gain with hirsutism and purple stretch marks. Additionally, she had hypertension and type 2 diabetes. The laboratory results showed inappropriately normal ACTH level in the setting of elevated serum cortisol level and 24 h urine cortisol and imaging study/pathology confirmed the diagnosis of primary pigmented nodular adrenocortical disease (PPNAD).
- Nodular primary pigmented adrenocortical disease (PPNAD) is characteristic of Carney Complex. In patients with histological evidence for PPNAD, only 60% to 70% of patients with Carney complex exhibit Cushing syndrome.
- PPNAD was named after the macroscopic appearance of the adrenal cortex that is characterized by the small-pigmented nodules less than 10 mm in their greatest diameter, most often surrounded by the atrophic cortex. The disease is bilateral, with the primary involvement of both adrenals.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Carney Complex

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## Question 595:

A 65-year-old male presents with complaints of fatigue, generalized weakness, polyuria, and polydipsia for the past seven days. A detailed medical history reveals that he has recently been diagnosed with hypertension and is on multiple medications but without blood pressure control. His vitals show a blood pressure of 190/100 mmHg, pulse rate of 90/min, and respiratory rate of 18/min. Physical examination is unremarkable. A CT scan of the abdomen reveals a mass in the right adrenal gland. What laboratory findings most likely will be found in this patient?

## Choices:

1. Increased serum potassium, increased urinary potassium, and increased extracellular fluid volume
2. Decreased serum potassium, increased urinary potassium, and increased extracellular fluid volume
3. Increased serum potassium, decreased urinary potassium, and decreased extracellular fluid volume
4. Decreased serum potassium, increased urinary potassium, and decreased extracellular fluid volume

Answer: 2 - Decreased serum potassium, increased urinary potassium, and increased extracellular fluid volume

## Explanations:

- The clinical scenario suggests the diagnosis of Conn syndrome. Conn syndrome refers to primary hyperaldosteronism caused by excess aldosterone production, in most cases from a benign adrenal tumor.
- Laboratory investigations relate to the increased production of aldosterone. Serum levels of potassium are decreased, and the urinary excretion of potassium is increased. Decreased serum potassium levels result in the symptoms of polyuria and polydipsia due to hypokalemia-induced nephrogenic diabetes insipidus.
- As a result of increased reabsorption of sodium due to aldosterone excess, more water is retained. the retained water causes extracellular fluid volume expansion, which is the mechanism behind the persistent hypertension.
- Unilateral adenomas causing increased aldosterone and hypertension can be resected surgically by laparoscopy. Spironolactone is the first-line medical treatment for Conn syndrome caused by bilateral hyperplasia of the adrenals.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Conn Syndrome

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## Question 596:

A 30- year-old male with a past medical history of diabetes presents with penile pain for 3 days. He is uncircumcised and says that he has good hygiene. He denies penile discharge or a history of sexually transmitted infections but is sexually active with many partners. On exam, you notice erythema on the glands with a curd-like discharge around the inflammation that is foul-smelling. There are no vesicles or ulcerations noted. No lymphadenopathy is appreciated. What is the treatment of choice for this patient?

## Choices:

1. Topical clotrimazole
2. Topical metronidazole
3. Penicillin G
4. Ceftriaxone and azithromycin

## Answer: 1 - Topical clotrimazole

## Explanations:

- This patient has signs or symptoms concerning for balanitis as he has erythema of the glands.
- Although he is active with several partners, the patient also has a history of diabetes, which makes him susceptible to infection by yeast, such as Candida. The curd-like discharge should clue you in that this is likely a Candida infection.
- The treatment of choice for balanitis secondary to yeast infection is topical antifungal therapy.
- Ceftriaxone and azithromycin are the treatment of choice for gonorrhea and chlamydia coinfection. This patient does not have the purulent discharge you would expect in this patient.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Balanitis

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## Question 597:

A 40-year-old female patient with a history of alcohol dependence presents to the clinic with a complaint of fatigue and unintentional weight loss for the past two months. She also noticed hoarseness in her voice during this time. She has a family history of thyroid disease in her father. She has a two-pack per day smoking history for 20 years. Physical examination shows a thin anxious female with a palpable, non-tender swelling on the front of her neck. A fine-needle aspiration confirms a well-differentiated carcinoma. The patient does not agree to surgical treatment, and an oral agent is decided which has both therapeutic and diagnostic purposes. What is the most appropriate advice for this patient?

## Choices:

1. Remain on bed rest for two days
2. Avoid contact with infants for at least two days
3. Consume only fluids for 24 hours
4. Do not become pregnant for two months

## Answer: 2 - Avoid contact with infants for at least two days

## Explanations:

- Radioactive iodine (RAI) is excreted in the urine, feces, saliva, sweat, tears, vaginal secretions, and breast milk. It can also cross the placenta.
- It is generally recommended that patients avoid close contact with others, especially infants or pregnant women, for at least two days after RAI therapy.
- It is also recommended that women do not become pregnant for 6 to 12 months after RAI.
- It is not necessary to restrict oral intake or activity level.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Radioactive Iodine Therapy

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## Question 598:

A 16-year-old girl with a history of body dysmorphic disorder/anorexia nervosa presents to the hospital with nausea, vomiting, and abdominal pain of 2 days duration. On examination, she has a tender right upper quadrant. She has a BMI of 16 kg/m2. Ultrasound of the liver shows hepatomegaly, and her lab values are significant for elevated transaminases, which were also noted many months ago. Further blood tests are negative for viral screen and autoimmune conditions. Liver biopsy shows pale and enlarged hepatocytes on hematoxylin and eosin stain. They also show prominent plasma membranes and increased cytoplasmic volume. Which of the following is most likely to explain the patient's clinical condition?

## Choices:

1. Glycogenesis in the hepatocytes
2. Nonalcoholic fatty liver disease
3. Wilson disease
4. Celiac hepatitis

## Answer: 1 - Glycogenesis in the hepatocytes

## Explanations:

- There has been a reported case of glycogen deposition with elevated liver enzymes in a patient with anorexia nervosa. The histological features on biopsy are enlarged hepatocytes with glycogen deposition. On treatment with diastase, the enzyme on PAS stain will breakdown the glycogen giving an impression of empty or "ghost cells."
- It is thought that hepatic glycogenosis is an adaptive protective mechanism from potential hypoglycemia in malnutrition.
- Hepatic glycogen deposition causes hepatomegaly, early satiety, and abdominal pain from the stretching of the liver capsule.
- Patients with body dysmorphic disorders and calorie restriction diet should be monitored for elevated liver enzymes and consider glycogenic hepatopathy as one of the diagnoses exhibiting persistently elevated transaminases.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Glycogenic Hepatopathy

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## Question 599:

A 40-year-old woman, gravida 2 para 2, comes to the office for the complaints of frequent urination, dry mouth, and fatigue for the last 6 months. Her medical history is significant for gestational diabetes in her previous pregnancy 6 years ago, which was managed appropriately with nutritional therapy, exercise, and glyburide. Her menstrual periods are regular, occurring every 28 days with 3-4 days of moderate bleeding. She is sexually active with her husband and desires to get pregnant. Family history is notable for diabetes mellitus type 2 in her mother. Her temperature is 37 C (98.6 F), blood pressure is 137/87 mmHg, the pulse is 77/min, and respirations are 16/min. Her BMI is 32 kg/m2. Further evaluation confirms the diagnosis of type 2 diabetes mellitus, and several oral hypoglycemic agents (OHAs) are discussed. She shares her preference for glyburide due to her past experience with it. Which of the following is the most appropriate advice regarding OHAs, including glyburide, for this patient?

## Choices:

1. Patients with pregestational diabetes can continue taking oral hypoglycemic agents throughout pregnancy
2. Patients taking oral hypoglycemic agents do not face any risk of hypoglycemia
3. Patients with pregestational diabetes should not be taking oral hypoglycemic agents during pregnancy
4. Patients taking oral hypoglycemic agents irregularly can become allergic to insulin, so following a regular schedule is critical

## Answer: 3 - Patients with pregestational diabetes should not be taking oral hypoglycemic agents during pregnancy

## Explanations:

- Glyburide is a second-generation oral hypoglycemic agent (OHA) from the class of sulfonylureas and is classified as an insulin secretagogue. It, along with other oral hypoglycemic agents, forms the basis of management of type 2 diabetes mellitus. In contrast, some selected OHAs, which include metformin and glyburide, are considered first-line in the management of gestational diabetes.
- However, it is generally preferred to achieve optimal glycemic control on intensive insulin therapy throughout pregnancy in women with pregestational diabetes, both type 1 and type 2. This is ideally done before conception so that the critical time of organogenesis is covered by appropriate glycemic control. Therefore, these drugs are discontinued, and insulin therapy is initiated.
- However, if a patient has good glycemic control on an OHA (e.g., metformin), it is generally advised to continue taking that drug while being shifted to insulin, and its levels have become sufficient for normal glycemic control.
- Regular meals, activity, and rest are crucial while taking oral hypoglycemic agents to have normal glycemic control. Blood glucose levels may fluctuate while on OHAs, with hypoglycemia being a very troublesome adverse-effect of sulfonylureas. Patients need to know the signs of both hypoglycemia and hyperglycemia for earlier identification and management of such side-effects. Oral hypoglycemics are not an insulin substitute and are not associated with the development of possible allergy to insulin.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Oral Hypoglycemic Medications

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## Question 600: A 16-year-old male patient is brought to the hospital by his mother because of poor grades and cramps in both his hands. On examination, he is obese with short stature and brachydactyly, and there is a positive Chvostek sign. What is the most likely diagnosis?

## Choices:

1. Osteomalacia
2. Carpal tunnel syndrome
3. Pseudohypoparathyroidism
4. Vitamin A toxicity

## Answer: 3 - Pseudohypoparathyroidism

## Explanations:

- Pseudohypoparathyroidism is a genetic disorder resulting in PTH resistance.
- They can display features of Albright hereditary osteodystrophy including obesity, short stature, brachydactyly, and cognitive impairment.
- Due to PTH resistance they have hyperphosphatemia, hypocalcemia, and elevated PTH levels.
- The molecular defect is a loss of function mutation in the alpha subunit of the stimulatory G-protein.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hyperphosphatemia

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## Section 7

Question 601: A 13-year-old boy with a past medical history of hypercholesterolemia is brought to the clinic for a follow-up visit. He reports fatigue, arthralgia, and abdominal pain. Physical exam reveals splenomegaly and yellow-white plaques on multiple extensor tendons. Complete blood count (CBC) shows anemia and thrombocytopenia. A lipid panel shows increased cholesterol despite taking statin therapy and prior dietary interventions, including a low-fat diet. Which of the following tests is most likely to confirm the diagnosis in this patient?

### Choices:

1. Lipoprotein(a)
2. Apolipoprotein B100
3. Plant sterol level
4. Fasted triglyceride level

## Answer: 3 - Plant sterol level

## Explanations:

- This patient likely has sitosterolemia, which is diagnosed by obtaining a plant sterol level.
- Hemolytic anemia, thrombocytopenia are all classic lab findings in sitosterolemia. Patients also report arthralgia, abdominal pain and can have splenomegaly.
- Lipoprotein(a) is a risk stratifying test, and elevated levels would not explain this patient's clinical findings.
- Sitosterolemia may lead to mildly increased apolipoprotein B100, but elevated levels would not be useful in obtaining the diagnosis.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hereditary Sitosterolemia

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## Question 602: A 9-year-old boy is diagnosed with type 1 diabetes mellitus. No one else in the extended family is known to have type 1 diabetes. He has two younger siblings, both of whom are healthy. What screening should his siblings undergo for type 1 diabetes and with what frequency?

## Choices:

1. No routine screening aside from symptoms recognition
2. Yearly HbA1c
3. Yearly oral glucose tolerance test (OGTT)
4. Monthly fasting plasma glucose

## Answer: 1 - No routine screening aside from symptoms recognition

## Explanations:

- Although no routine screening is recommended, siblings of those with type 1 diabetes should be aware of the symptoms of chronic hyperglycemia including polyuria/polydispia, unintential weight loss, malaise. There is some evidence that siblings of those with type 1 diabetes are on average diagnosed "sooner" than those without a family history due to recognition of typical symptoms of chronic hyperglycemia.
- Type 1 diabetes risk has both genetic determinants as well as likely environmental influences. The incidence and prevalence of type 1 diabetes have increased in the last generation, likely due to several factors, though exact causes are not clear.
- Epidemiological and natural history studies of type 1 diabetes mellitus risk have identified risk to family members. Identical twins have the risk of approximately 40% to 50%, fraternal twins around 20% to 30%, and siblings about 5%. The prevalence of type 1 diabetes is associated with ethnic background. In the United States, the prevalence is about 0.3%.
- Ongoing research trials aim to identify those at risk of developing type 1 diabetes and modify that risk through pharmacotherapy, immune therapy, or changing environmental exposures. However, no routine screening of siblings is currently recommended.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Diabetes Mellitus Type 1 In Children

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## Question 603: A 30-year-old female who has been experiencing weight gain, acne, and hair growth on her face. A low-dose dexamethasone suppression test (LDDST) is ordered. Which of the following is the appropriate method of testing?

## Choices:

1. 1 mg of dexamethasone intravenously given every hour for 7 hours. Serum cortisol level is measured after 7 hours
2. 0.5 mg of oral dexamethasone every six hours for 48 hours. Serum cortisol level is measured after 48 hours
3. 1 mg oral dexamethasone given at 11 pm and 1 mg oral dexamethasone given an hour later. Serum cortisol level is measured the following morning, between 8 am and 9 am
4. 1 mg of oral dexamethasone given between 11 pm and midnight. Serum cortisol level is measured the following morning, between 8 am and 9 am

## Answer: 4 - 1 mg of oral dexamethasone given between 11 pm and midnight. Serum cortisol level is measured the following morning, between 8 am and 9 am

## Explanations:

- Low dose dexamethasone suppression test (LDDST ) can be used for the initial diagnosis of CS, as a screening or a confirmatory test. There are two types of low dose dexamethasone suppression test - (i) Overnight, 1 mg test ; (ii) Two day, 2 mg test.
- There are two types of LDDST - (i) Overnight, 1 mg test ; (ii) Two day, 2 mg test. (i) Overnight, 1 mg test: Due to ease and convenience, overnight test is the most commonly used screening test. Dexamethasone 1 mg is administered orally between 11 PM and midnight and serum cortisol level is drawn the next morning between 8 AM - 9 AM. (ii)Two-day, 2 mg test: Dexamethasone 0.5 mg is administered orally every 6 hours (9 AM, 3 PM, 9 PM, 3 AM) for two days (total dose 4 mg). Serum cortisol level is drawn 6 hours (9 AM) after the last administered dose
- Serum cortisol level of 1.8 mcg/dl (50 nmol/L) is the recommended cut-off value in LDDST that increases the diagnostic sensitivity to approximately 95%. At this cut-off value, the specificity of the two-day test is 97% to 100% and for the overnight test is 86%.
- In LDDST, serum cortisol less than 1.8 mcg/dl suggests adequate HPA axis suppression and excludes CS. However, serum cortisol levels greater than 1.8 mcg/dl, should be verified with a second screening test (24-hour urinary free cortisol or late-night salivary cortisol), prior to establishing a confirmed diagnosis of CS.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Dexamethasone Suppression Test

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## Question 604:

A 46-year-old gentleman with a history of type 2 diabetes mellitus for 1 year presents with night sweats and morning headaches for about the last 3 months. He reports that he has started a new diet plan after he learned about it on the television. His diet plan includes a big breakfast and a small lunch. He skips his dinner. He has been compliant with his insulin regimen as prescribed by his primary care provider about 6 months ago. He has a history of travel to India 6 years ago. His most recent Hba1C is 7.1%. His PPD test is negative and his weight is stable. You notice morning hyperglycemia on his blood glucose log. What is the cause of his symptoms?

## Choices:

1. Inadequate insulin dose
2. Lack of exercise
3. Tuberculosis infection
4. Nocturnal hypoglycemia

## Answer: 4 - Nocturnal hypoglycemia

## Explanations:

- The correct answer is 4 - nocturnal hypoglycemia. The patient has been taking the usual amount of insulin however has not been having his dinner. Hence he is having hypoglycemia at night which causes him to have sweating and morning headaches.
- This phenomenon is also known as the Somogyi effect. It is rebound hyperglycemia in the morning after nocturnal hypoglycemia.
- It can be triggered by excessive dosing of insulin or by inadequate caloric intake. Since his PPD is negative and his weight has been stable, tuberculosis is an incorrect answer choice.
- It can be diagnosed by measuring the nocturnal blood glucose. Continuous glucose monitoring is very useful in this diagnosis.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Human Insulin

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## Question 605:

A 67-year-old man presents to the clinic for follow up. He was recently discharged from the hospital after being treated for myocardial infarction. He has no significant past medical history. He does, however, report a sedentary lifestyle, 35 pack-year smoking history, and eating a diet that mostly consists of red meat. The patient was prescribed aspirin, atorvastatin, clopidogrel, lisinopril, and carvedilol upon discharge from the hospital. He is willing to stop smoking and start a diet based on fish and green vegetables. Which of the following best describes the most likely change in this patient's risks with this dietary change?

## Choices:

1. Decreased risk of gastric cancer
2. Decreased risk of abdominal aortic aneurysm
3. Decreased risk of atrial fibrillation
4. Decreased risk of atherosclerosis

## Answer: 4 - Decreased risk of atherosclerosis

## Explanations:

- The patient has been advised a low-fat diet after his myocardial infarction.
- There has been a direct relationship between dietary fat intake and cardiovascular disease (CVD). Dietary cholesterol has been a focus of considerable attention due to a direct connection between diet and blood cholesterol levels and the subsequent risk for coronary artery disease.
- There is abundant literature to suggest that a decrease or modification of serum cholesterol is a possible way to prevent atherosclerosis. Decreasing the amount of fat intake is an effective means of lowering the serum cholesterol concentration. Hence, a low-fat diet has been widely advocated by clinicians for reducing the cardiovascular-related morbidity and mortality of their patients.
- A decrease in the risk for gastric cancer and abdominal aortic aneurysms is likely as a result of smoking cessation, not a low-fat diet. Low-fat diets might be associated with decreased risks of breast and colon cancers. While all cardiovascular risks are decreased with a low-fat diet, the direct effect documented is due to its effect on atherosclerosis.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Low Fat Diet

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## Question 606: A patient with squamous cell lung cancer presents with confusion, constipation, anorexia, and bloating. Further review reveals two fractured hips and ongoing renal failure. What is the most likely cause of these findings?

## Choices:

1. Metastatic spread
2. Osteoporosis
3. Hypercalcemia
4. Hyperkalemia

## Answer: 3 - Hypercalcemia

## Explanations:

- This is a paraneoplastic syndrome causing hypercalcemia. The most common cause of hypercalcemia is hyperparathyroidism followed by hypercalcemia of malignancy.
- The ectopic parathyroid hormone secretion also is associated with hypophosphatemia. Hypophosphatemia needs to be corrected while treating hypercalcemia.
- Despite the hypercalcemia, the tumor is resectable, and the levels will normalize following excision.
- Two percent of all cancers are associated with hypercalcemia. If severe, hypercalcemia can be life-threatening and is associated with poor prognosis.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Malignancy-Related Hypercalcemia

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## Question 607:

A 7-year-old girl is being evaluated for short stature (SS). She was born small for gestational age (SGA) and failed to "catch up" in childhood. Two of her first degree relatives have a similar history but were not investigated. Investigations reveal a high IGF-1 level and an exaggerated growth hormone (GH) response to GH stimulation tests. Recombinant growth hormone (rGH) treatment is started, but the response is not satisfactory. Which of the following is the most likely diagnosis?

## Choices:

1. Isolated familial GHD (iFGHD)
2. A microdeletion of the X chromosome
3. IGF receptor haploinsufficiency
4. SGA due to environmental causes

## Answer: 3 - IGF receptor haploinsufficiency

## Explanations:

- This patient is born SGA with a poor catch up in childhood. She has a family history of a similar illness that was not investigated.
- A high IGF-1 level, an exaggerated GH stimulatory response, and a poor response to rGH treatment should alert the practitioner to IGF-1 gene anomalies like haploinsufficiency.
- IGF-1 is essential for growth in-utero and postnatally. A deficiency or resistance to IGF-1 results in poor growth.
- Haploinsufficiency of IGF-1 R causes the corresponding mRNA to decay through a non-sense mediated pathway, reduction in the wild-type IGF-1 R gene, and less activation of the IGF-1 axis leading to SS. This mechanism has been described in families leading to some cases of familial short stature (FSS). SGA producing SS has a better response to rGH. iFGHD has low IGF-1 and responds well to rGH. Microdeletion of the X chromosome produces a Turner syndrome with preserved ovarian function and SS.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Familial Short Stature

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## Question 608:

A 34-year-old woman presents to the clinic for coarse facial hair. The hair has been slowly growing on her upper lip and cheeks for the past three months. She has tried threading and hair removal treatments, but it always comes back. A review of systems also reveals excessive thirst and urination. She has a BMI of 36 $kg/m^2$. She has tried losing weight with different diets but has been unable to do so. Physical examination shows coarse hair on the cheeks and upper lip. She is also noted to have velvety brown pigmentation bilaterally in the axillae and groins. Bedside ultrasound shows multiple cyst-like structures in both ovaries. Which of the following is the most accurate test to identify the underlying metabolic abnormality in this patient?

## Choices:

1. 2-hour glucose tolerance test
2. Hemoglobin A1c
3. C-peptide
4. Hyperinsulinemic-euglycemic clamp technique

## Answer: 4 - Hyperinsulinemic-euglycemic clamp technique

## Explanations:

- The patient's clinical presentation is most consistent with a diagnosis of polycystic ovarian syndrome. This condition is often associated with metabolic abnormalities, including insulin resistance. Flexural pigmentation is a hallmark sign of insulin resistance.
- The hyperinsulinemic-euglycemic clamp technique, also known as the glucose clamp technique, accurately measures glucose disposal through a combination of insulin and glucose infusion, which is used to calculate insulin resistance based on body size. Initial insulin infusion suppresses endogenous glucose release from glycogenolysis.
- Glucose uptake is a measure of insulin sensitivity. Insulin resistance is the mathematical inverse of insulin sensitivity.
- The glucose clamp technique is a research tool. Simpler markers for insulin resistance, which correlate well with the glucose clamp technique, often are used in research analysis and can be readily used in a clinical setting.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Insulin Resistance

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## Question 609:

A 54-year-old man is being evaluated during an annual wellness exam. He currently has no concerns or complaints and is asymptomatic. He has a history of hypertension, for which he takes amlodipine daily. On physical exam, vital signs are within normal limits. A physical exam is unremarkable, with a regular heart rate and clear breath sounds bilaterally. His BMI is 30.2 kg/m2. Notable laboratory values show a fasting plasma glucose level of 142 mg/dL today. A hemoglobin A1c performed a week prior was 4.8%. Which of the following is the next best step in the evaluation of this patient?

## Choices:

1. Fasting plasma glucose (FPG)
2. Two-hour oral glucose tolerance test (GTT)
3. Hemoglobin A1c
4. Random point-of-care blood glucose

## Answer: 1 - Fasting plasma glucose (FPG)

## Explanations:

- Three types of blood tests can diagnose glucose intolerance: the fasting plasma glucose, two-hour glucose tolerance test, and the hemoglobin A1c. If multiple blood tests are ordered, but the results are inconsistent, a repeat of the abnormal test is warranted to confirm the diagnosis.
- The blood sample for a fasting plasma glucose is taken after an 8 hour overnight fast. As per ADA (American Diabetic Association), FPG levels between 100 and 125 mg/dL (5.6 to 6.9 mmol/L) are diagnostic of impaired fasting glucose, and a diagnosis of diabetes requires a repeated value greater than or equal to 126 mg/dL.
- The fasting plasma glucose is a quick and inexpensive test and has an established standard but has a high day to day variability.
- A hemoglobin A1c gives an average of blood glucose over the last two to three months. Patients with HbA1c between 5.7% to 6.4% (39 to 47 mmol/mol) are diagnosed as having an increased risk of diabetes or prediabetes. For a diagnosis of diabetes, the HbA1c levels should be greater than or equal to 6.5% (48 mmol/mol). HbA1c is a convenient, standardized test but is costly and may have lower sensitivity due to other factors such as sickle cell disease, pregnancy, hemodialysis, anemia due to blood loss or transfusion, or erythropoietin therapy.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Glucose Intolerance

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## Question 610: A 43-year-old asymptomatic female presents to discuss recent lab results. Her results are significant for a serum calcium level of 11.6 mg/dL (normal: 8.4-10.4 mg/dL). She has a longstanding history of hypertension that has been well controlled with a beta-blocker. She denies a history of kidney stones or pancreatitis. Further workup shows elevated serum PTH, and ultrasound reveals a hypoechoic mass on the posterosuperior right lobe of the thyroid. What is the best next step in the management of this patient?

## Choices:

1. Minimally invasive parathyroidectomy
2. Biopsy the mass
3. Technetium-99 scan
4. Repeat ultrasound in 6 months

## Answer: 3 - Technetium-99 scan

## Explanations:

- This patient presentation is consistent with primary hyperparathyroidism, and the ultrasound results suggest a parathyroid adenoma. A localization study, such as a 99mTc or 4D CT, should be performed to assist in operative planning for a minimally invasive procedure.
- Minimally invasive parathyroid surgery is becoming more common due to improved cosmetic outcomes and decreased complication rates.
- Localization studies are critical to operative planning as they allow for the identification of all pathologic tissue. If an open neck exploration is to be performed, localization is less critical.
- Per the NIH criteria for parathyroidectomy, this patient is a surgical candidate as she is 50 years of age and has a serum calcium level of more than 1 mg/dL above the upper limit of normal.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Parathyroid Adenoma

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## Question 611:

A 60-year-old woman with a history of extreme obesity, diabetes, and hypertension presents to the clinic for follow-up. She underwent bariatric surgery (Roux-en-Y gastric bypass) four months ago. Before the surgery, she had poor diabetes control with a BMI of 45 and an HbA1c of 10%. Now, she has achieved a significant weight loss with a BMI of 29 and HbA1c of 7.5%. A decrease in which of the following hormones is most likely responsible for the change in the patient's condition?

## Choices:

1. Motilin
2. Leptin
3. Ghrelin
4. Somatostatin

## Answer: 3 - Ghrelin

## Explanations:

- Ghrelin stimulates appetite and can cause weight gain.
- Strategies to inhibit ghrelin or its receptor have the potential to emerge as anti-obesity therapy.
- Bariatric surgery results in a decrease in ghrelin levels, and this could be a plausible reason for the patient's weight loss.
- In Prader-Willi syndrome, the increase in ghrelin results in an increase in appetite and obesity.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Biochemistry, Ghrelin

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## Question 612:

A 65-year-old retired woman presents to the clinic with generalized bone pains and difficulty in rising from the chair for the past six months. The symptoms started insidiously and are progressively getting worse. Her past medical history is unremarkable. She has had no surgeries. Her natural menopause was ten years ago, and she does not take any medications. She used to be physically active but is unable to do so now. Physical examination reveals generalized tenderness over the limb muscles and skeleton and pelvic girdle weakness but no other neurological deficits. Her laboratory tests reveal a serum calcium 9.6 mg/dL, serum albumin 4.1 g/dL, serum ionized calcium 5.1mg/dL, eGFR 80 mL/min, 25-OHD3 16 ng/mL and intact PTH 169 pg/mL. DEXA scan reveals a T-score of -2.7 at the lumbar spine. She is started on treatment with vitamin D3. She returns for a review four months later. Her symptoms are much improved, and she has resumed activities. Repeat laboratory tests show ionized calcium 5.8 mg/dL, 25-OHD3 46 ng/mL, and PTH 155 pg/mL. What is the next best step in the management of this patient?

## Choices:

1. Calcium-free diet and stop any calcium supplements
2. Repeat a DEXA scan of the lumbar spine, hips, and distal radii
3. Prescribe cinacalcet
4. Parathyroidectomy

## Answer: 4 - Parathyroidectomy

## Explanations:

- This patient has classical primary hyperparathyroidism with elevated serum calcium and PTH that was masked by concomitant vitamin D deficiency. Because of the coexisting vitamin D deficiency, she initially presented with normocalcemic hyperparathyroidism. Correction of vitamin D deficiency unmasked the primary hyperparathyroidism.
- Parathyroidectomy is the correct treatment for this patient who has significant lumbar spine osteoporosis as recommended by the expert panel on Primary hyperparathyroidism.
- Calcium in recommended amounts for her age is mandatory as restriction will increase PTH via feedback and worsen her condition. Her vitamin D deficiency is treated and she should continue maintenance doses daily.
- Parathyroidectomy has shown to significantly improve her bone health and improve bone density reducing fracture risk. Cinacalcet will decrease serum Ca and PTH modestly but has no effect on bone density and is of no use in this patient. DEXA scan intervals are a minimum of one year to see meaningful changes and earlier tests are unrevealing.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Normocalcemic Hyperparathyroidism

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## Question 613:

A 16-year-old male presents with delayed puberty. He says that his friends at school have all surpassed him in height and have started to grow facial hair. He is distressed and says, "I look like a child compared to my friends." He has no medical problems and takes no medications. There is a history of delayed puberty in his maternal uncle. He is an honors student in his school and is currently the leader of the student council. On examination, temperature is 36 C, blood pressure is 125/83 mmHg, pulse is 81 beats/min, and respiratory rate is 14 breaths/min. His height and weight are in the 25th and 20th percentile for his age, respectively. Oral mucosa examination reveals mild cleft palate. There is no restriction in eye movement, and pupils are equal and reactive to light and accommodation bilaterally. There is no facial hair or body hair. The testicles are present bilaterally and are small, non-tender, and have no swellings or masses. A small amount of pubic hair is present above the penis. Blood tests reveal low levels of gonadotropin-releasing hormone (GnRH), follicle-stimulating hormone (FSH), luteinizing hormone (LH), and testosterone. Testicular volume is 3 mL. He has normal levels of thyroid-stimulating hormone, adrenocorticotropin releasing hormone, and antidiuretic hormone. Magnetic resonance of the brain reveals no abnormalities. Is it concluded that his condition is due to defective migration of the gonadotropin-releasing hormone cells during fetal development. Which of the following additional findings will most likely be found in this patient?

## Choices:

1. Anosmia
2. XX chromosome
3. Polycystic kidneys
4. Dilated aortic root

## Answer: 1 - Anosmia

## Explanations:

- This patient is presenting with delayed puberty, as shown by the lack of development of secondary sexual characteristics, low testicular volume, and low blood levels of GnRH, FSH, LH, and testosterone.
- Delayed puberty in males is defined by a testicular volume of less than 4 mL by the age of 14 years old.
- There are many potential causes of delayed puberty in males. Defective migration of GnRH cells during fetal development is a possible cause of delayed puberty and is known as Kallman syndrome.
- Kallman syndrome is an X-linked form of hypogonadotropic hypogonadism. It is defined by defective migration of GnRH cells and defective formation of the olfactory bulb during fetal development. Patients present with delayed onset of puberty with low levels of GnRH, FSH, LH, and testosterone. These patients will also exhibit anosmia (loss of the ability to smell), due to defective olfactory bulb formation. Anosmia is the primary differentiating sign between Kallman syndrome and other causes of delayed puberty.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Kallmann Syndrome

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## Question 614:

A 65-year-old man presents to the clinic for a 1-year history of left lower extremity weakness, accompanied by recurrent falls, thigh muscle atrophy, and 28 lbs weight loss, accompanied by lumbar and posterior thigh pain. Eventually, he progressed to using a wheelchair for mobilization. During these past few weeks, the patient has noticed an improvement in motor strength and has been able to stand. He denies any particular intervention and is now optimistic about his recovery, due to recently seen improvement in his state. He underwent a sural nerve biopsy, which aided in the diagnosis of this disease. What would likely be the results found in the biopsy?

## Choices:

1. Microvasculitis induced ischemia
2. Nerve transection
3. Nerve avulsion
4. Nerve atrophy

## Answer: 1 - Microvasculitis induced ischemia

## Explanations:

- Identification of this syndrome is challenging since its presentation may have similar findings as other more worrisome diagnoses, and there is no single definitive test. This is a clinical diagnosis, the reason why health professionals need to be aware and have a clinical suspicion based on characteristic features in a newly diagnosed diabetic patient. Usually seen in the elderly, predominantly type two diabetic patients, asymmetrical motor weakness, accompanied by pain, proximal muscle atrophy, weight loss, with a self-limited resolution of symptoms. In some cases, nerve biopsy may be used to aid in the diagnosis.
- Other diagnostic studies may aid in the diagnosis: erythrocyte sedimentation rate (ESR), C-reactive protein(CRP), CT, MRI, electromyography, etc.
- The typical presentation for diabetic amyotrophy is an elderly patient with asymmetrical, progressing, diffuse lower extremity pain, motor-weakness, accompanied with muscle wasting, weight loss, and areflexia, with a clear relation to uncontrolled diabetes (type II diabetes) and close to complete recovery with appropriate glycemic management. In severe cases, patients may become wheel-chair bound or present with paraplegia or quadriplegia. Partial or complete recovery is expected with this disease.
- Atrophy, avulsion, and transection of the nerves are not seen in the nerve biopsy in patients with diabetic amyotrophy since this disease is thought to be a microvasculitis caused by an immune response and eventually causing nerve ischemia and is not described with the rest of the options.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Diabetic Amyotrophy

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## Question 615:

An 8-year-old girl is brought to the clinic due to vaginal bleeding and breast development. About 2 months ago, her mother noticed that the patient began developing breasts. 2 days ago, the patient told her mother that she was bleeding from her vagina. Upon further questioning, the patient reports pain in her arms and legs and that she has trouble moving her limbs. On physical exam, there is tenderness to palpation in all 4 extremities. She has full range of motion of all extremities but reports some difficulty with moving. There is a hyperpigmented spot without uniform edges on the right arm. Tanner stage 1 breasts are noted with no pubic or axillary hair. There is blood in the vaginal introitus without evidence of trauma. What is the most likely cause of the patient's condition?

## Choices:

1. A mutation resulting in a nonfunctioning androgen receptor
2. A mutation resulting in over-active G protein
3. A mutation resulting in a non-functioning G protein
4. A mutation resulting in a non-functioning ion channel

## Answer: 2 - A mutation resulting in over-active G protein

## Explanations:

- This patient presenting with precocious puberty, cafe-au-lait spots, and bone pain and limb stiffness has McCune-Albright syndrome.
- McCune-Albright syndrome can also present with Cushing syndrome, thyrotoxicosis, gigantism or acromegaly, or hypophosphatemic rickets.
- McCune-Albright syndrome is due to an activating mutation in the alpha subunit of the G stimulatory protein.
- A young girl with a nonfunctioning androgen receptor will have a failure to menstruate rather than precocious menstruation.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Physiology, Cellular Receptor

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## Question 616:

A patient with type 2 diabetes mellitus is undergoing evaluation. She has a history of edema, but she is not currently edematous. She does not have an insulin regimen. Treatment with a thiazolidinediones (TZD) is initiated. After 3 months, she has mild edema; glycemic response is insufficient. Consider the following treatment options: Option 1: Discontinue TZD, Option 2: Increase TZD dose, Option 3: Initiate spironolactone. Which of these treatment options is most appropriate for this patient

## Choices:

1. Option 1 only
2. Option 1 and Option 3
3. Option 3 only
4. Option 2 and Option 3

## Answer: 4 - Option 2 and Option 3

## Explanations:

- Peripheral edema is a common side effect of the TZD.
- It is more likely to occur in patients with a history of edema and in those treated with insulin.
- In such patients, it is recommended to initiate treatment with a low dose of TZD. In 1 to 3 months if the patient's glycemic response is inadequate and he or she has not developed significant edema, the dose can be increased.
- Most patients with mild edema respond to a thiazide diuretic or spironolactone. In patients with more extensive edema, combination therapy with a moderate dose loop diuretic is sometimes required.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Thiazolidinediones

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## Question 617:

A 42-year-old female came to the emergency department with severe right upper quadrant pain and lightheadedness. Her vitals showed a temperature of 102 F, pulse rate of 130/min, blood pressure of 100/60 mmHg, respiratory rate of 20/min, and oxygen saturation of 92% on room air. Physical examination revealed bilateral periorbital swelling, homogenous swelling on the front of the neck, bibasilar crackles, positive Murphy sign, and bilateral pitting edema. S3 was also heard on auscultation. Emergent imaging showed gallstone cholecystitis. She gradually became hypoxic, requiring invasive mechanical ventilation. Her labs showed WBC of 15000 cells/L, serum creatinine of 2.0 mg/dL, total bilirubin of 4 mg/dL, direct bilirubin of 2 mg/dL, increased ALP, and TSH of 0.02 mIU/L. She is prepared for emergency cholecystectomy and started on intravenous fluids, broad-spectrum antibiotics, beta-blockers, and propylthiouracil. Further labs showed very high levels of T4 and free T3. The administration of which of the following can lower perioperative mortality?

## Choices:

1. Radioactive iodine
2. Methimazole
3. Lithum
4. Lugol iodine

## Answer: 4 - Lugol iodine

## Explanations:

- Lugol iodine solution consists of potassium iodide with iodine in water. It can inhibit the immediate release of thyroid hormones from the gland.
- It is important to identify thyroid storm in surgical patients because if left untreated, it leads to high perioperative mortality.
- Iodine salts are used for patients scheduled for thyroidectomy to combat the thyroid storm.
- Patients with thyroid storm need to be treated in the intensive care unit (ICU) with aggressive fluid resuscitation. Arrhythmias and hyperthermia, if present, need to be treated. Radioactive iodine is the treatment of choice for more stable patients and can be done in the outpatient department. Methimazole is anti-thyroid medication but has a slower onset of action. Lithium is used to treat bipolar disorder, which has a side effect of thyroid dysfunction.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Thyroid Storm

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## Question 618:

A 65-year-old male with a past medical history of poorly controlled type 2 diabetes mellitus, hypertension, and hyperlipidemia, presented to the emergency department with complaints of dizziness, nausea, sweating, and palpitations. He did not lose consciousness. His BP was 130/85 mmHg, HR 110/minute, RR 16/minute, and T 36.9 C. He is alert and oriented to person, but not time or place. He is accompanied by his wife, who says he is at his baseline mental status. His home medications include lisinopril, atorvastatin, metformin, glimepiride, insulin glargine, and a sliding scale of lispro. Blood tests revealed glucose of 45 mg/dL, high blood insulin level, and undetected C peptide. His hypoglycemia was corrected, and his symptoms improved. The wife states that two days ago, he was telling her that he wants to die, and she thinks he has been in a very bad mood recently. Which of the following is the most likely cause of his hypoglycemia?

## Choices:

1. Metformin
2. Insulinoma
3. Insulin lispro
4. Glimepiride

## Answer: 3 - Insulin lispro

## Explanations:

- Insulin is secreted in the blood from the beta cells of the pancreas along with a C peptide chain.
- Insulin lispro is short-acting insulin used in the treatment of type 1 and type 2 diabetes mellitus and can be abused or accidentally overdosed by some patients leading to hypoglycemia.
- Unlike endogenous insulin, synthetic insulin lacks the C peptide chain and thus when administered will cause elevated insulin levels in the blood with undetectable C peptide, like the patient in the scenario above.
- Glimepiride ingestion and insulinoma will cause endogenous hyperinsulinemia, and C-peptide will be elevated as well. Unlike glimepiride which is in the class of sulfonylureas, metformin does not cause hyperinsulinemia

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Factitious Hypoglycemia

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## Question 619:

A 52-year-old female presented to her primary care provider with a complaint of dyspareunia and hot flashes for six months. She has no past medical history and no medication use. Her family history is significant for her mother with ovarian cancer, hypertension, chronic kidney disease, and a paternal grandmother who passed away from pancreatic cancer. Her social history includes one glass of wine with dinner six nights a week, denies tobacco use, and is a retired school teacher. Her sexual health history includes a last menstrual period 14 months ago, a monogamous relationship with a male partner, condom use for contraception, and denies a history of sexually transmitted infection. Physical exam yields vital signs that are within normal limits, and pelvic exam findings include atrophic appearing external female genitalia, dry vaginal epithelium, no abnormal discharge: normal-appearing cervix, and no palpable adnexal masses. The rectovaginal exam was within normal limits. The patient is inquiring about estrogen-only hormone replacement therapy as a treatment of her symptoms. The estrogen hormone replacement therapy increases the risk of the following types of cancer in this patient?

## Choices:

1. Pancreas
2. Ovarian
3. Endometrial
4. Kidney

## Answer: 3 - Endometrial

## Explanations:

- Unopposed estrogen use increases the risk of endometrial cancer. It is essential that physicians screen patients for the appropriate cancer risk factors before prescribing estrogen.
- Estrogen increases the risk of blood clots.
- The risk of endometrial cancer was not increased by estrogen-progestin therapy.
- Estrogen replacement therapy increases the risk of breast cancer but only after ten years. Combination hormone replacement therapy increases breast cancer risk by about 75%, even when used for only a short time.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Estrogen

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 620:

A 66-year-old woman with a history of type 2 diabetes presents to the clinic for a follow-up. She complains of bilateral lower limb pain for the past six months. She has tried duloxetine and gabapentin. She reports mild improvement of symptoms with duloxetine but stopped taking gabapentin due to sedation. Physical examination is unremarkable. She still complains of 4/10 pain in both legs. Which of the following is the next best step in the management of this patient?

## Choices:

1. Topical capsaicin
2. Topical diclofenac acid
3. Oral morphine
4. Spinal cord stimulator

## Answer: 1 - Topical capsaicin

## Explanations:

- The patient most likely has diabetic neuropathy. A combination of multiple pharmacological therapies is often necessary to treat neuropathic pain. Less than 50% of patients with neuropathic pain will achieve adequate pain relief with a single agent.
- Adjunctive topical therapy, such as lidocaine or capsaicin cream, can be utilized as well.
- Topical capsaicin cream is an option for chronic neuropathic or musculoskeletal pain unresponsive to other treatments.
- Topical diclofenac is not as effective as capsaicin for neuropathic pain. Opioids should be considered the last step of pharmacologic pain management. Spinal cord stimulator is usually employed after all pharmacologic therapeutic options have been exhausted.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Chronic Pain

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## Question 621:

A 41-year-old man presents with burns and pain out of proportion in his hand and fingers. The pain started after making contact 10 minutes ago with a metal cleaner at the agricultural equipment factory where he works. On examination, there is a skin ulcer and necrosis on his right hand and thumb, index, and middle fingers. There is no bone or tendon exposure. He is orientated to time, place, and person. An EKG shows QT prolongation and peaked T waves. What serum test is most important to order?

## Choices:

1. Calcium
2. Iron
3. Chloride
4. Sodium

## Answer: 1 - Calcium

## Explanations:

- The patient in the clinical scenario has an hydrofluoric acid burn. Calcium becomes bound to hydrofluoric acid, and the resultant hypocalcemia may be fatal.
- The symptoms of fluoride toxicity are quite rapid and chiefly gastrointestinal. However, if the presentation is delayed, one may see both neurological and cardiovascular effects.
- An EKG should be done stat because of hyperkalemia, which may present as peaked T waves, widened QRS, bradycardia, or atrioventricular nodal blockade. In addition, hypocalcemia may present with QT prolongation.
- Lavage with calcium solutions has been tried but has not proven to be effective. There is no antidote to fluoride toxicity, and the treatment is supportive.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hydrofluoric Acid Burns

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 622:

A 45-year-old man is evaluated in the hospital by podiatry for a chronic, non-healing ulcer on his right foot. He has been admitted three times in the past seven months for recurrent infections of the foot. He has a history of chronic renal disease due to uncontrolled hypertension and diabetes type II, diagnosed when he was 34 years old. The wound was healing well after an incision and drainage a week ago, but now the area around the wound appears erythematous, cellulitic, and draining purulent fluid. Osteomyelitis is suspected. What is the most appropriate next step in management?

## Choices:

1. Start antibiotics
2. Soft-tissue culture from wound swab
3. Superficial wound swab
4. Bone biopsy

## Answer: 2 - Soft-tissue culture from wound swab

## Explanations:

- The initial evaluation of a patient with a suspected diabetic foot ulcer is to identify if the wound is acutely infected or part of normal wound healing. If the wound is not healing as expected or if there is suspicion for the development of osteomyelitis, the patient will need further workup and intravenous antibiotics. Before starting antibiotics, the nurse or technician must swab the wound to obtain cultures to guide antibiotic therapy.
- A swab culture is the most commonly used method to obtain information on identifying the bacterial species causing the infection. It is non-invasive and relatively cost-effective. An appropriate technique is necessary to obtain an ideal sample. Too often, samples are inadequate or requiring another culture as it grows contaminant, likely due to a superficial swab. Proper technique requires a deep swab to collect a tissue sample and to use enough pressure to express fluid from the wound. Superficial swabs will only show the colonizing organism, not necessarily a deeper tissue infection.
- If a wound swab is a method of obtaining a culture, it is most ideal to obtain samples of the tissue after debriding and cleaning of the wound to avoid contamination.
- If osteomyelitis is suspected, a bone culture is preferred than soft tissue culture if it is clinically feasible; however, this is invasive and not always indicated initially.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Diabetic Foot Infections

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## Question 623:

A 56-year-old female with a history of hypertension and end-stage liver disease secondary to primary biliary cholangitis which is on the liver transplant list is evaluated for the risk of post-transplantation osteoporosis. Her laboratory tests show a serum calcium level of 7.9 mg/dl, albumin level of 3.2 g/dl, and creatinine of 0.85 mg/dl. 25-hydroxy vitamin D level is 28 ng/ml. X-ray of the lumbar spine shows no vertebral fractures. Bone densitometry shows a T-score of -2.0 at the lumbar spine and -1.8 at the femoral neck. What is the best course of action to prevent post-transplantation osteoporosis in this patient?

## Choices:

1. Obtain serial bone densitometry scans after the transplantation and consider bisphosphonate therapy if osteoporosis develops
2. Start calcium and vitamin D supplementation now, obtain serial bone densitometry scans after transplantation and consider bisphosphonate therapy if osteoporosis develops
3. Start calcium and vitamin D supplementation now and start bisphosphonate therapy after transplantation as soon as renal function stabilizes
4. Start calcium and vitamin D supplementation now and there is no need to monitor for osteoporosis after transplantation as she is at low risk

## Answer: 3 - Start calcium and vitamin D supplementation now and start bisphosphonate therapy after transplantation as soon as renal function stabilizes

## Explanations:

- All patients planned for solid organ or bone marrow transplantation should be evaluated for their risk of developing post-transplantation osteoporosis during the pre-transplant period.
- Calcium and vitamin D levels should be optimized for all patients that are being worked up for transplantation.
- The current data available suggest that preventive therapy for osteoporosis should be initiated on all patients who undergo transplantation as soon as possible after renal function stabilizes.
- Patients with a history of osteopenia before transplantation are especially at high risk for developing post-transplantation osteoporosis.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Transplantation Osteoporosis

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## Question 624: A 30-year-old patient with a BMI of 30 kg/m2 consumes a 1200 kcal meal. Blood is drawn at baseline and every 2 hours. The peak of the ghrelin hormone is at six hours. Which of the following is also likely to be true?

## Choices:

1. Stimulation of Y1 and Y5 receptors
2. Increase secretion of insulin
3. Suppression of orexin-A and B hormone
4. Stimulation of proopiomelanocortin/cocaine and amphetamine-regulated transcript (POMC/CART) pathway

## Answer: 1 - Stimulation of Y1 and Y5 receptors

## Explanations:

- During fasting orexigenic pathway is activated by the stimulation of Y1 and Y5 receptors on orexin/melanin-concentrating hormone second-order neurons in response to raised ghrelin levels.
- Fasting results in a surge in ghrelin hormone levels, which activates the orexigenic pathway in the lateral hypothalamus area.
- Activation of the orexigenic pathway leads to increased hunger and decreased energy expenditure.
- Proopiomelanocortin/cocaine and amphetamine-regulated transcript (POMC/CART) receptors are activated during the anorexigenic pathway.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Physiology, Obesity Neurohormonal Appetite And Satiety Control

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## Question 625:

A 36-year-old woman, G3P1A1, visited office at the 26th week of gestation for a prenatal visit. She is worried about her previous spontaneous abortion and another child born at 33 weeks of gestation. Her mother has diabetes too. She complains of repeated urination, increased thirst, and appetite. She has no history of alcohol intake, illicit drugs, and smoking. Vital sign show BP 130/80 mm Hg, pulse rate is 75/minute. On examination, she is irritated, lethargic, dry skin, and oral cavity. Her Body mass index is 32 kg/m2. Fasting blood glucose level is 120 mg/dl, HBA1c 6.6%. What would be the most common complication for the fetus?

## Choices:

1. Perinatal mortality
2. Neural tube defects and anencephaly
3. Congenital heart defects
4. Skeletal deformities

## Answer: 2 - Neural tube defects and anencephaly

## Explanations:

- The central nervous system anomaly is the most common complication of gestational diabetes.
- Neural tissue uptake of glucose is higher as compared to other tissue.
- Impaired autophagy due to inhibition by Forkhead box O3 transcription factor activation by hyperglycemia.
- Endoplasmic reticulum stress due to the accumulation of unfolded proteins leads to defects in autophagy.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Diabetic Embryopathy

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## Question 626:

A 65-year-old male who underwent CABG (coronary artery bypass grafting) three months ago presents for a follow-up visit. He denies any symptoms at this time and has attended cardiac rehab. His current medications include metoprolol succinate 50 mg daily, lisinopril 10 mg daily, aspirin 81 mg daily, clopidogrel 75 mg daily, and simvastatin 40 mg daily. His blood pressure is 120/70 mm Hg. Heart rate 60 beats per minute. The exam is otherwise unremarkable. His last echocardiogram showed an ejection fraction of 40-45 percent with anterior hypokinesis. He had a lipid panel which showed an HDL of 25 mg/dl, LDL of 120 mg/dl, triglycerides of 180 mg/dl and total cholesterol 190 mg/dl. What medical changes should be recommended in addition to continuing dietary and lifestyle changes with which he reports compliance?

## Choices:

1. Add extended release niacin 500 mg daily
2. Add ezetemibe 10 mg daily.
3. Switch from simvastatin 40 mg to atorvastatin 40 mg daily
4. Stop clopidogrel

## Answer: 3 - Switch from simvastatin 40 mg to atorvastatin 40 mg daily

## Explanations:

- High intensity statin therapy is recommended for secondary prevention after acute coronary syndromes since it has been shown to better prevent recurrent cardiac events.
- High-intensity statins include atorvastatin 40-80 mg daily and rosuvastatin 20-40 mg daily. The expected LDL reduction with such therapy is approximately 50 percent. The national lipid association recommends a goal LDL of less than 70 mg/dl for secondary prevention.
- Niacin, unlike statins, has not been shown to have a consistent benefit in preventing cardiovascular events despite raising HDL.
- Dual antiplatelet therapy is recommended for one year after a myocardial intervention.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hyperlipidemia

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## Question 627: Sulfonylureas bind to a subunit of potassium ATP-dependent channels to stimulate the pancreatic beta cells to release insulin. Which of the following patient scenarios is the best candidate to receive sulfonylurea for type 2 diabetes?

## Choices:

1. A 36-year-old female with a hemoglobin A1c of 5.9% currently taking no medications
2. An 82-year-old male with a history of hypoglycemic episodes whose current hemoglobin A1c is 9.7%
3. A 48-year-old female who has a hemoglobin A1c of 7.8% after taking metformin for the past 3 months
4. A 62-year-old male with a history of anaphylaxis to sulfa-containing medications whose hemoglobin A1c is 11% on metformin and liraglutide

## Answer: 3 - A 48-year-old female who has a hemoglobin A1c of 7.8% after taking metformin for the past 3 months

## Explanations:

- The American Diabetes Association (ADA) recommends metformin as a first-line agent for all patients with type 2 diabetes mellitus unless contraindicated. Sulfonylureas can be utilized as adjuvant therapy for patients not at target hemoglobin A1c after 3 months of treatment with metformin.
- Sulfonylureas are classified as secretagogues. Sulfonylureas bind to the ATP-sensitive potassium channels (K-ATP) on the pancreatic beta cells and stimulate insulin secretion. Hypoglycemia is the most common adverse efect associated with sulfonylureas because they stimulate insulin release regardless of blood glucose levels.
- Cross-reactivity of sulfonamides has been highly debated in a sulfa-allergic patient. Prescribers should try to avoided sulfonylureas in patients with a history of sulfa allergy.
- Sulfonylurea monotherapy can be considered in patients who are intolerant to or have a contraindication to metformin use especially if cost is an issue. Sulfonylureas are relatively inexpensive.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Sulfonylureas

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## Question 628: A 42-year-old man was diagnosed with acromegaly and recently underwent transsphenoidal resection of a pituitary adenoma. What is the next most accurate step to assess if the surgery was successful?

## Choices:

1. MRI pituitary immediately post op
2. IGF-1 level immediately post-surgery
3. GH level immediately post-surgery
4. GH level after OGTT 4 months after surgery

## Answer: 4 - GH level after OGTT 4 months after surgery

## Explanations:

- To assess for remission for acromegaly after surgery, IGF-1 level should be done. The timing is important. Immediate post-surgery IGF-1 levels are elevated due to their long half-life and can take at least 3 months to normalize.
- In addition to checking IGF-1 levels, one can check a GH level after 75 g of glucose being administered. Some argue that checking GH levels after a normal IGF-1 level may not add additional information; however, up to 30% of patients can have discordant results.
- A normal IGF-1 level and GH suppressed to less than 1 ng/mL after OGTT is indicative of remission. These levels should be checked at least annually as relapse can occur many years after remission.
- Even though repeat imaging should be done after surgery, it should be done a minimum of 3 months after the surgery as it can take that long for the sterile compressed sponge and fat packing to be resorbed and not affect image interpretation assessing for disease recurrence.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Acromegaly

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## Question 629:

A 65-year-old woman presents to the clinic for a follow-up. She has obesity class II, hypertension, dyslipidemia, history of stroke, and bilateral hip arthritis. She denies smoking or alcohol ingestion. Family history is noncontributory. Labs are remarkable for HbA1c 6.4%, fasting glucose 104 mg/dL, total cholesterol 169 mg/dL, triglycerides 200 mg/dL, and LDL 90 mg/dL. The physical exam is unremarkable except for a BMI of 36 kg/m2. The abdominal circumference is 94 cm (37 inches), blood pressure 142/90 mmHg, and heart rate 92/min. Her medications include losartan, hydrochlorothiazide, simvastatin, and ezetimibe. What is the best initial therapy for this patient?

## Choices:

1. Liraglutide
2. Orlistat
3. Glyburide and simvastatin
4. Phentermine-topiramate

## Answer: 1 - Liraglutide

## Explanations:

- This patient has metabolic syndrome, prediabetes, increased triglycerides, low HDL, hypertension, and increased waist circumference. The most appropriate therapy would be a medication that, other than causing weight loss, will also improve her metabolic parameters.
- Liraglutide has been shown to decrease the incidence of diabetes in overweight or obese patients in association with a reduced-calorie diet and increased physical activity in the study SCALE.
- Liraglutide and semaglutide are GLP-1 agonists approved for patients without diabetes as weight loss medication.
- Orlistat has also been shown to improve metabolic parameters, including blood pressure, lipids, and incidence of diabetes, but randomized trials have shown less weight reduction than randomized trials with liraglutide, although no head-to-head studies are available for comparison. Phentermine-topiramate should not be recommended for patients with high cardiovascular risk due to the potential increase in heart rate observed with this combination.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Pharmacologic Therapy For Obesity

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## Question 630: A 40-year-old patient comes into the clinic and would like to discuss strategies to implement weight loss. She says that she has been on a keto diet, and has been running one mile 5 times a week. She has been doing this for three months but has still been gaining weight. Past medical history is significant for impaired glucose tolerance. Family history is significant for diabetes mellitus in her mother and obesity in her father. She does not smoke or drink. Her BMI is 30. What is the most important factor in weight maintenance?

## Choices:

1. Energy balance
2. Low carbohydrates
3. Increased activity
4. Low fat

## Answer: 1 - Energy balance

## Explanations:

- The main principle of weight maintenance is energy balance. The energy expenditure must equal energy intake. Negative energy balance leads to weight loss, and energy surplus leads to weight gain.
- Low fat, increased activity, and low carbohydrates are all strategies that can be implemented to lose weight. However, if the patient is not in a negative energy balance, the patient will not lose weight. Adaptive changes to resist weight loss and weight loss maintenance complicate the balance.
- Two ways to alter energy balance are diet and physical exercise. Obesity was formerly viewed as an individual problem, treated primarily by individual or family-based medical and psychological methods. Obesity is now regarded as complex interactions of biological and psychosocial factors.
- Many factors can alter each individual's energy balance, such as metabolism and stress.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Weight Gain Prevention Strategies

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 631: A 62-year-old man presents to his provider with questions regarding his current calcium and vitamin D supplements. Since his dietary preferences are low in calcium, he has been taking the recommended amount of oral calcium in the form of a 1,200 mg pill, taken once daily. However, he has begun to feel constipated and nauseous after taking this calcium pill. Which of the following types/doses of calcium supplementation would allow for the greatest calcium absorption and the fewest side effects?

## Choices:

1. 600 mg of calcium carbonate, taken twice daily with food
2. 600 mg of calcium carbonate, taken twice daily without food
3. 1200 mg of calcium carbonate, taken once daily with food
4. 600 mg of calcium carbonate, taken twice daily with a non-calcium containing an antacid

## Answer: 1 - 600 mg of calcium carbonate, taken twice daily with food

## Explanations:

- Calcium carbonate has higher rates of absorption in acidic environments. Taking the supplement with food increases acid secretion and the overall absorption of calcium.
- Given the rate-limited nature of calcium absorption, the overall absorption of calcium supplements increases when taken in multiple, smaller doses. Therefore, splitting the entire dose of calcium into two doses throughout the day can increase overall absorption.
- Since calcium carbonate depends on stomach acid for absorption, taking the supplement with a non-calcium-containing antacid would decrease the overall calcium absorption.
- Taking smaller doses of calcium can also decrease the risk of calcium's common gastrointestinal side effects (e.g., dyspepsia, constipation, nausea/vomiting). Therefore, taking two smaller doses of calcium throughout the day may be beneficial for elderly patients at risk for these side effects.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Dietary Calcium

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 632:

A 43-year-old female with a past medical history of diabetes mellitus and hypertension comes the clinic for a routine visit. She reports compliance with her diabetic and hypertensive medications but notes that she sometimes feels "sweaty" and fatigued in the mornings. She checks her blood pressure during the time and notes that her systolic blood pressure is greater than 100 mmHg. When she performs a sugar check, she notes that her blood glucose is 60 mg/dL. She reports that drinking orange juice helps resolve her symptoms. Her diabetic medications include metformin 500 mg twice a day and glimepiride once daily. What is the likely cause and what will be the expected c-peptide level?

## Choices:

1. Metformin is the likely cause; normal C-peptide levels
2. Glimepiride is the likely cause; normal C-peptide levels
3. Metformin is the likely cause; increased C-peptide levels
4. Glimepiride is the likely cause; increased C-peptide levels

## Answer: 4 - Glimepiride is the likely cause; increased C-peptide levels

## Explanations:

- Hypoglycemia is the autonomic and neurogenic manifestation resulting from neural deprivation of glucose. Diabetic medications are a particular etiology of hypoglycemic episodes.
- Sulfonylureas (such as glimepiride) help with diabetes management by promoting the pancreatic secretion of insulin. Metformin (a biguanide) works in a different fashion, decreasing hepatic production of glucose. Glimepiride, as opposed to metformin, poses a risk for hypoglycemia due to induction of insulin secretion.
- Endogenous insulin (insulin secreted by the pancreas) has a C-peptide component detectable on routine lab work up. Exogenous insulin (i.e. insulin injected) lacks this C-peptide component.
- A patient taking glimperide will have elevated C-peptide levels due to enhanced secretion of endegenous insulin. Metformin will not cause hypoglycemia and has no effect on C-peptide levels since it has no influence over pancreatic secretion of insulin.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hypoglycemia

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## Question 633:

A 65-year-old man with type 2 diabetes mellitus has recently been diagnosed with a prolactin-secreting pituitary microadenoma. The plasma level of prolactin is above normal. He shows symptoms of sexual dysfunction and gynecomastia. Which of the following is the best initial therapy for this patient?

## Choices:

1. Apomorphine
2. Bromocriptine
3. Cabergoline
4. Pergolide

## Answer: 2 - Bromocriptine

## Explanations:

- A dopamine agonist is a first-line treatment for hyperprolactinemia due to pituitary tumors.
- Dopamine inhibits prolactin synthesis and secretion from the pituitary gland.
- Both cabergoline and bromocriptine have been approved for the treatment of hyperprolactinemia.
- Although cabergoline may be more productive with fewer adverse effects than bromocriptine, bromocriptine has been approved by the FDA for the treatment of type 2 diabetes.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Dopamine Agonists

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## Question 634:

A 16-year-old male presents with gynecomastia that has increased over the last 18 months. He is monogamous, but his girlfriend complains about his low libido. He had delayed puberty and has sparse axillary and facial hair. He has no other past medical history and is on no medications. He had learning problems in school. He is 190 cm tall with eunuchoid features. His genital exam shows small testes and sparse hair. Select the most likely diagnosis.

## Choices:

1. Testicular feminization
2. Testicular dysgenesis
3. Klinefelter syndrome
4. Mixed gonadal dysgenesis (45,X/46,XY mosaicism)

## Answer: 3 - Klinefelter syndrome

## Explanations:

- Patients with Klinefelter syndrome are generally tall with long legs and have 47, XXY karyotype secondary to meiotic nondisjunction.
- There is usually low sex drive, poor secondary sex development, small testes 3.5 cm in length, gynecomastia, and, in many cases, learning disabilities.
- Testosterone is low while FSH, estradiol, and LH are elevated.
- Patients have an increased risk of thromboembolic disease, diabetes mellitus, breast tumors, and obesity.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Klinefelter Syndrome

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## Question 635:

A 31-year-old woman presents to the clinic for prenatal advice. She is known to have a low HDL level and peripheral neuropathy since childhood. Her past surgical history includes tonsillectomy for a cholesterol deposition while she was 11 years old, and splenectomy for a splenic rupture after a contact sports injury when she was 17. The woman mentions that her husband does not have any similar illness and has no reported family history of similar conditions. Which of the following best describes the most likely inheritance pattern of the patient's disease?

## Choices:

1. Sporadic 1/1,000,000 chance of developing the disease
2. All of her children will be carriers but not affected
3. Male children will only inherit the disease while females will not
4. 25% will be affected, 50% carriers, and 50% normal

## Answer: 2 - All of her children will be carriers but not affected

## Explanations:

- The woman has Tangier disease as there is a significant decrease in HDL and accumulation of cholesterol eaters in many organs within the body, particularly the reticuloendothelial systems. These organs will appear yellow-orange in color and larger in size. That is why these patients will have an increased risk of premature cardiovascular events at a younger age than normal individuals.
- Tangier disease exhibits an autosomal recessive pattern for its clinical features while exhibits an autosomal codominant trait for its biochemical findings. This means if the patient received both the recessive genes from their parents, they would have an extremely low level of HDL. And If the patient inherited only one gene from their parents, they will have a relatively low level of HDL (about half the normal level in normal individuals) but no overt clinical manifestation of the disease.
- Homozygous parent married to a normal individual will have 100% carrier siblings.
- Heterozygous parents for the disease will have a 25% chance of having an affected sibling or homozygote sibling, 50% of having a carrier sibling or heterozygous sibling, and 25% of having a normal sibling.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Tangier Disease

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## Question 636:

A 24-year-old female with a history of type 1 diabetes and hypothyroidism presents to the emergency department complaining of dizziness, palpitations, and diaphoresis. Her medications include insulin glargine, insulin lispro, and levothyroxine with which she is compliant. The patient reports that she accidentally doubled the typical dose of her once-daily insulin. Treatment is initiated. For how many hours will the patient be at increased risk of hypoglycemia?

## Choices:

1. 6 hours
2. 12 hours
3. 24 hours
4. 48 hours

## Answer: 3 - 24 hours

## Explanations:

- Glargine insulin is a long-acting insulin. Its onset of action is between 3 and 6 hours, depending on the formulation. Insulin glargine administration does not result in a pronounced peak when administered subcutaneously. When injected subcutaneously, the insulin will form a precipitate, which results in small amounts of insulin glargine being released over time.
- The duration of action of insulin glargine is 24 hours, and if excess amounts are administered, the patient will be at increased risk for hypoglycemia during that time. The typical dose for insulin glargine is once-daily.
- The rate of absorption, onset, and duration of action may be affected by the local blood supply, exercise, temperature, or presence of lipodystrophy.
- Six hours is for short-acting insulin, which includes lispro. Many variables affect the half-life of a drug. Amphetamine has a half-life of 10 to 12 hours.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Glargine Insulin

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## Question 637:

A 23-year-old woman reports visual disturbances, stating that she can no longer see well peripherally on both the right and the left. She thinks this may be the cause of depressive symptoms as she is lethargic due to weight gain, has insomnia, and can't concentrate. She denies any change in her caloric intake. On physical examination, she points to numerous changes in her skin such as easy bruising, acne problems, and purple-red striae on her trunk. MRI of her brain shows a tumor. What area of the brain is the tumor most likely found?

## Choices:

1. Occipital lobe
2. Pituitary
3. Caudate nucleus
4. Putamen

## Answer: 2 - Pituitary

## Explanations:

- Cushing disease, unlike Cushing syndrome, refers to one specific cause, a pituitary adenoma.
- Due to the overproduction of adrenocorticotropic hormone (ACTH), these tumors cause a variety of endocrine and psychiatric disturbances.
- Diagnostic tests used are salivary and blood serum cortisol, 24-hour urinary free cortisol, dexamethasone suppression test, and bilateral inferior petrosal sinus sampling. Multiple tests should be used.
- First-line treatment is surgical resection of the ACTH-secreting pituitary adenoma. Pituitary radiation or bilateral adrenalectomy may be needed for postoperative persisting hypercortisolemia.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Cushing Disease

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## Question 638:

A 65-year-old male patient presents for routine follow-up for his radical prostatectomy, which was done seven years ago to treat his prostate cancer. He reports that he had erectile dysfunction, but it resolved on its own. His charts from previous visits show serum prostate-specific antigen (PSA) levels have been slowly rising over the past few years. Labs are obtained, and the PSA level is currently 70 ng/ml. With the suspicion of prostate cancer recurrence, starting a drug to lower his testosterone levels is decided. What is the mechanism of action of the drug that would be used to reduce the patient's testosterone to castration levels?

## Choices:

1. 5-alpha reductase inhibitor
2. Phosphodiesterase type 5 (PDE5) Inhibitor
3. Gonadotropin-releasing hormone (GnRH) analog
4. Synthetic human chorionic gonadotropin (HCG)

## Answer: 3 - Gonadotropin-releasing hormone (GnRH) analog

## Explanations:

- Leuprolide is an FDA-approved gonadotropin-releasing hormone agonist that is used for the management of endometriosis, uterine leiomyomata (also known as uterine fibroids), treatment of central precocious puberty in children, and advanced prostate cancer.
- In advanced prostate cancer, leuprolide is used as a palliative treatment to help reduce comorbidities and improve quality of life. Leuprolide lowers testosterone which in turn minimizes the stimulatory effect it normally has on androgen-sensitive prostate cancer cells; therefore causing them to undergo apoptosis.
- For the treatment of prostate cancer, providers should monitor FSH and LH levels, serum testosterone levels, and prostate-specific antigen levels. Fatigue, weakness, and urinary tract obstruction should be watched for during initial treatment. Screening should be performed for diabetes prior to starting treatment as leuprolide can worsen glycemic control.
- Blood glucose and HbA1c should be periodically measured throughout therapeutic use. Electrocardiograms and electrolyte levels should be monitored occasionally as well.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Leuprolide

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## Question 639:

A 38-year-old female with a past medical history of severe gastroesophageal reflux was diagnosed with left inferior parathyroid adenoma on a parathyroid scan. She was referred for parathyroidectomy and successfully underwent the procedure two weeks ago. Her intraoperative parathyroid hormone decreased from 232 pg/mL to 34 pg/mL. During her workup of hypercalcemia, she had a dual-energy x-ray absorptiometry, which showed osteoporosis of the left distal one-third of the radius. There were no signs of a fragility fracture. Which of the following action needs to be taken regarding her osteoporosis?

## Choices:

1. No medical treatment for osteoporosis should be indicated at this time
2. Start cinacalcet now
3. Start oral bisphosphonate now
4. Treat with intravenous bisphosphonate now

## Answer: 1 - No medical treatment for osteoporosis should be indicated at this time

## Explanations:

- The patient was most likely suffering from primary hyperparathyroidism due to adenoma and thus underwent a surgical excision procedure.
- Patients need to wait several years to re-evaluate their bone mineral density after successful parathyroidectomy.
- Patients with reduced bone mineral density due to primary hyperparathyroidism typically experience a significant increase following successful surgery. Therefore, no anti-resorptive treatment is indicated at this time.
- The parathyroid hormone (PTH) has already normalized after the surgery. There is no role of cinacalcet in the treatment of this patient after successful parathyroid surgery. Cinacalcet can lower PTH and calcium levels but has not been shown to improve bone mineral density. Patients with a history of severe gastroesophageal reflux disease should not be treated with oral bisphosphonates. Patients with persistent osteoporosis several years after successful parathyroidectomy should be considered for anti-resorptive agents like bisphosphonates.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Primary Hyperparathyroidism

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## Question 640:

A 45-year-old female presents following hospitalization for acute heart failure. The patient has a past medical history of type 2 diabetes mellitus, congestive heart failure, and a 15-year history of alcohol dependence. The patient is currently managed with metformin, furosemide, and atorvastatin. Her most recent HBA1c report is 8.9%. Physical examination reveals 2+ pitting edema around both her lower extremities. The clinician decides to add a medication for her uncontrolled glucose that also has beneficial effects for her congestive heart failure. This is agent exerts its glycemic effects by which action?

## Choices:

1. Insulin secretion
2. Intestinal glucose absorption
3. Urinary glucose excretion
4. Hepatic gluconeogenesis

## Answer: 3 - Urinary glucose excretion

## Explanations:

- Dapagliflozin is a SGLT-2 inhibitor indicated in adult patients with type 2 DM to improve the control of blood glucose in addition to diet and exercise.
- Cardiovascular (CV) indications for dapagliflozin include minimizing the hospitalization attributed to heart failure in type 2 DM patients with underlying CV illness or several CV risk factors, decreasing the risk of CV mortality and hospitalization in adult subjects with underlying heart failure, and decreased ejection fraction (EF) with new york heart association (NYHA) classification II-IV.
- Dapagliflozin exerts its mechanism of action by inhibiting the SGLT-2 receptors in the kidney and reducing the reabsorption of filtered glucose, decreasing the renal threshold for glucose (RTG), and further promoting urinary glucose excretion.
- Sulfonylureas increase insulin secretion, alpha-glucosidase inhibitors decrease Intestinal glucose absorption, and biguanides decrease hepatic gluconeogenesis and intestinal glucose absorption, and are incorrect mechanisms.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Sodium-Glucose Transport Protein 2 (SGLT2) Inhibitors

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## Question 641:

A 30-year-old woman presents to the clinic with difficulty in perceiving colored objects and blurring of vision for the past one month. She has been recently diagnosed with Graves orbitopathy 3 months ago. On examination, a best-corrected visual acuity of 20/200 in both eyes is seen. Both eyes have severe conjunctival congestion, chemosis, and lid edema. Bilateral upper lid retraction of 4 mm and proptosis is noted. Her computed Tomography (CT) scan reveals enlarged extra-ocular muscles in both eyes with crowding at the apex. She is started on intravenous methylprednisolone (1 g/day for 3 consecutive days followed by dose tapering) after a normal baseline work-up. At 2 weeks, the best-corrected visual acuity worsened to 10/200 in both eyes. Which of the following is the next best step in the management of this patient?

## Choices:

1. IV cyclophosphamide
2. Another round of intravenous methylprednisolone
3. Surgical decompression
4. Concurrent fractionated radiotherapy and tocilizumab

## Answer: 3 - Surgical decompression

## Explanations:

- The patient most likely has active dysthyroid optic neuropathy. Worsening of symptoms and persistent activity at 2 weeks is a sign of inadequate response to steroids.
- In an uncomplicated case of thyroid eye disease, surgical decompression is performed after achieving 6 months of euthyroid status, and an inactive stage of the disease. Active DON is the only indication of doing an urgent surgical decompression, regardless of thyroid status and the 'activity' of the disease.
- The cumulative dose of intravenous methylprednisolone must not exceed 8 g as this may lead to deleterious consequences on the patient's systemic condition.
- The role of radiotherapy and immunosuppressive agents, like tocilizumab in DON, is not yet established.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Dysthyroid Optic Neuropathy

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## Question 642:

A 60-year-old African American male with a history of hypertension and benign prostatic hyperplasia presents with difficulty sustaining erection onset 3 months ago. Patient associates decreased libido and increased fatigue. Patient health questionnaire 9 is 0. Labwork showing normocytic anemia. Repeat morning testosterone levels less than 300 ng per dL. What is a contraindication to the patient's treatment plan?

## Choices:

1. Prostate-specific antigen level of 3.5 nanograms/mL
2. Second cousin diagnosed with prostate cancer
3. Hematocrit of 40%
4. History of skin cancer

## Answer: 1 - Prostate-specific antigen level of 3.5 nanograms/mL

## Explanations:

- A prostate-specific antigen level above 3 nanograms/mL in high-risk patients, including African Americans and men with a first-degree relative with prostate cancer, is a contraindication to androgen replacement therapy.
- One of the common causes of osteoporosis in men is testosterone deficiency. It is important to rule out osteoporosis and to repeat dual-energy x-ray absorptiometry (DXA) scans 1 to 2 years after initiating therapy in hypogonadal men with osteoporosis.
- Referral to urology is recommended if there is an increase in the PSA level greater than 1.4 nanograms/mL within any 12-month period.
- If the hematocrit rises above 54%, then stop therapy as soon as possible.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Androgen Replacement

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## Question 643:

A 54-year-old male with diabetes comes for evaluation. His blood sugars have fluctuated widely in the past three months. He has bought alpha-lipoic acid (ALA) over the counter and planned on supplementing it for his condition. He then consulted with the provider about the safety of the supplement since there is none written on the box. What would be the appropriate advice to the patient?

## Choices:

1. He should take ALA as much as possible since it requires a significant amount to work best
2. He should take ALA according to the labeled direction since that will minimize the side effects
3. He should take ALA as much as possible since there is no reported overdose in human and it will reduce the progression of neuropathy significantly
4. He should take ALA according to the labeled direction since taking more will have no extra benefit.

## Answer: 4 - He should take ALA according to the labeled direction since taking more will have no extra benefit.

## Explanations:

- According to studies, 200 mg to 400 mg of alpha-lipoic acid daily provide the best benefit for improving neuropathy symptoms in diabetes. Also, studies do not show any extra benefits for taking a large dosage.
- Even though there are no established side effects of alpha-lipoic acid in humans, one should be very careful in taking a high dosage of ALA. Studies show that a high dosage shows adverse effects on animals, such as hepatotoxicity and neuropsychological effects.
- Alpha-lipoic acid is an over the counter supplement that is considered safe. There are very few reported intoxication cases of ALA. In fact, studies show that humans can safely take up to 2400 mg of ALA a day without experiencing any side effects.
- Taking a high dosage of alpha-lipoic acid doesn't show any benefits. ALA doesn't have dosage-dependent effects. Also, there are no reported side effects in humans for ALA.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Alpha-Lipoic Acid

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## Question 644:

A 16-year-old male with heterozygous familial hypercholesterolemia seeks your advice about treatment. He is very concerned because his mother had a myocardial infarction at the age of 38. Moreover, he has noted some nodules on the back of his legs just above the ankles. His LDL-cholesterol was 286 mg/dL before starting treatment. After taking rosuvastatin 40 mg a day, his LDL-cholesterol is 160 mg/dL. What advice should be given to this patient?

## Choices:

1. PCSK9 (Proprotein convertase subtilisin/kexin type 9) inhibitors will not lower LDL-cholesterol because he is already on maximal dose statin
2. His renal function needs to be checked before starting a PCSK9 inhibitor
3. If a PCSK9 inhibitor is prescribed in addition to the current dose of rosuvastatin his LDL-cholesterol will decrease but this is an “off-label” use of a PCSK9 inhibitor
4. The nodules he has noted on the back of his legs just above the ankles are xanthomas in the Achilles tendons that are commonly found in such patients

## Answer: 4 - The nodules he has noted on the back of his legs just above the ankles are xanthomas in the Achilles tendons that are commonly found in such patients

## Explanations:

- Tendon xanthomas, often appearing first in the Achilles tendon, are a common physical finding in patients with heterozygous familial hypercholesterolemia.
- PCSK9 inhibitors will lower the LDL-cholesterol in patients with heterozygous familial hypercholesterolemia when used as monotherapy or in combination with a statin.
- When prescribing PCSK9 inhibitors no dose adjustment is needed for patients with mild or moderately impaired renal function.
- Both alirocumab and evolocumab have an FDA indication to treat patients with heterozygous familial hypercholesterolemia.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### PCSK9 Inhibitors

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## Question 645:

A 65-year-old male patient with a long-standing history of diabetes presents to a clinic for a follow-up visit. He was advised of certain lifestyle changes and dietary modifications by his primary care physician during the last visit. Although, according to the patient's account, he has attempted these lifestyle changes over the previous four months, there is no improvement in glycemic control. His recent HbA1c is 8.2%, and a GFR of 40 mL/min/1.73m^2. Physical examination demonstrates darker pigmentation of the axillary folds and the base of the neck. Since his glycemic control has not changed, the clinician decides to consider medical therapy for better glycemic control. Dosage of which of the following medication must be reduced in this patient?

## Choices:

1. Insulin
2. Metformin
3. Glipizide
4. Pioglitazone

## Answer: 2 - Metformin

## Explanations:

- Insulin, glipizide, and pioglitazone can be used in chronic kidney patients.
- Metformin can cause lactic acidosis but only when the kidneys are unable to filter as effectively.
- A reduced dose is appropriate in patients with renal insufficiency. It should be a maximal daily dose of 2000?mg with a GFR of 45–60 mL/min/1.73 m2 and 1000 mg with a GFR of 30–45 mL/min/1.73 m2.
- Caution should be taken with the use of pioglitazone in congestive heart failure patients due to water retention.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Nephrotoxic Medications

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## Question 646:

A 50-year-old male presents to the clinic complaining of visual field defects and headaches. The clinician suspects hypopituitarism and order lab work. He also finds out the patient currently has lung cancer and is being treated with a PD-1 inhibitor as per oncology. Labs are still pending, but the patient wants to know what could be the cause of his symptoms, and the clinician tells him that as of now, he most likely has what diagnosis?

## Choices:

1. Lymphocytic hypophysitis
2. Granulomatous hypophysitis
3. Xanthomatous hypophysitis
4. Secondary hypophysitis

## Answer: 4 - Secondary hypophysitis

## Explanations:

- Secondary hypophysitis is described as pituitary gland inflammation due to diseases such as sarcoidosis, hemochromatosis, amyloidosis, granulomatosis with polyangiitis, tuberculosis, syphilis, and pituitary gland inflammation due to medications such as immunomodulatory drugs including immune checkpoint inhibitors such as cytotoxic T-lymphocyte-associated protein 4 (CTLA-4) and programmed death 1 (PD-1) medications.
- He is on a PD-1 inhibitor for his lung cancer, and this is the most likely cause of his hypophysitis pending lab work.
- Primary hypophysitis describes pituitary gland inflammation itself. Primary hypophysitis can be further categorized based on histology as lymphocytic. Due to her cancer therapy, she does not have primary hypophysitis.
- Granulomatous hypophysitis is also categorized under primary hypophysitis. Several conditions, including xanthomatous hypophysitis, can cause primary hypophysitis. Since this patient is on a PD-1 inhibitor, this drug is probably causing her hypophysitis, making her have secondary hypophysitis.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Lymphocytic Hypophysitis

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## Question 647:

A 15-year-old African-American girl presents for a well adolescent exam. She says she has irregular and heavy periods. She has no past medical history. There is no known family history because she was adopted. On examination, there are poorly defined hyperpigmentation areas of the skin in her body folds. Her body mass index (BMI) is in the 85th percentile for age. What is the most appropriate next step in evaluating this patient?

## Choices:

1. Schedule one-year follow-up
2. Perform hemoglobin A1c and random glucose test
3. Perform urinalysis
4. Perform a pregnancy test

## Answer: 2 - Perform hemoglobin A1c and random glucose test

## Explanations:

- Type 2 diabetes mellitus is a metabolic disorder characterized by peripheral insulin resistance and failure of beta cells to compensate, leading to hyperglycemia. While once considered an adult pathology, it is increasing in prevalence in children.
- The American diabetes association (ADA) suggests screening for type 2 diabetes mellitus every three years starting at the age of ten (or at the onset of puberty) for patients who are obese, BMI greater than or equal to the 95th percentile for age.
- According to the patient's BMI, she is overweight. She has acanthosis nigricans and symptoms of polycystic ovarian syndrome. African Americans are at increased risk for diabetes mellitus.
- Screening can be done with a hemoglobin A1c, an oral glucose tolerance test, or random glucose.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Pediatric Type 2 Diabetes Mellitus

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## Question 648:

A 35-year-old white woman who has a previous history of celiac disease presents to her primary care provider with multiple symptoms including tiredness, constipation, significant weight gain around 10 pounds (4.5 kg) in 3 months. She denies any neck pain. She denies any recent upper respiratory tract infection or pneumonia. On physical exam, her thyroid gland is palpable and is diffusely enlarged but nontender. Her blood work shows TSH 23 IU/ml (reference range 0.36- 3.74 IU/ml, free T4 is 0.5 ng/dL (reference range 0.7-1.4 ng/dL) She has a history of anxiety and depression and is taking citalopram. A thyroid ultrasound is ordered for further evaluation. What is the most likely diagnosis?

## Choices:

1. Hashimoto's thyroiditis
2. Drug-induced thyroiditis
3. Graves disease
4. Bacterial thyroiditis

## Answer: 1 - Hashimoto's thyroiditis

## Explanations:

- This patient is most likely suffering from Hashimoto thyroiditis. She has a history of celiac disease, which is an autoimmune disease and makes her more likely to have another autoimmune disease like Hashimoto thyroiditis. Hashimoto thyroiditis is the most common cause of hypothyroidism in the United States.
- Hashimoto thyroiditis typically presents as painless thyroiditis with symptoms of hypothyroidism including tiredness, feeling excessively cold, constipation, and weight gain.
- Hashimoto thyroiditis increases the risk of hypothyroidism which can be treated with levothyroxine.
- Hashimoto thyroiditis can also increase the risk of thyroid cancer; patients with Hashimoto thyroiditis and a thyroid nodule should be monitored with ultrasound.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Thyroiditis

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## Question 649: Select the medication used to restart the menstrual cycle and induce ovulation in women with polycystic ovary syndrome.

## Choices:

1. Rosiglitazone
2. Metformin
3. Clomiphene
4. Bupropion

## Answer: 3 - Clomiphene

## Explanations:

- Clomiphene is the first-line drug for treatment of infertility in patients with polycystic ovary syndrome (PCOS). Second-line medications are used for infertile women with clomiphene citrate-resistant PCOS.
- Metformin is a biguanide and insulin-sensitizing agent that has been found to induce ovulation in polycystic ovarian syndrome without the use of other fertility drugs, but it is not used first-line.
- Clomiphene enhances fertility and ovulation especially by its effect on hypothalamus where it binds for prolonged period to estrogen receptor and depletes them, blocking negative feedback inhibition effect of circulating endogenous estrogen. This results in a pulsatile release of hypothalamic gonadotropin-releasing hormone (GnRH) which promotes secretion of follicle stimulating and luteinizing hormones and indirectly stimulating ovulation.
- Clomiphene is classified as being category B, meaning no fetal defects have been found in animal studies in the second and third trimester. As first trimester effects are not known, it is usually discontinued at the time of a positive pregnancy test.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Polycystic Ovarian Disease

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## Question 650:

A 29-year-old man with a history of IV drug use and HIV with noncompliance to HAART therapy presents to the emergency department with complaints of fever, chills, neck pain for the past 2 days. On physical exam, the thyroid gland is very tender to palpation, and diffuse cervical lymphadenopathy is present. Vital signs include a blood pressure of 90/60 mmHg, heart rate 110/min, and SpO2 96%. Laboratory tests reveal WBCs 14,000/microL, hemoglobin 11 g/dl, hematocrit 30%, and platelets 300,000/microL. Thyroid function tests show TSH 0.9 IU/mL (0.270 - 4.200 IU/mL), free T4 4 ng/dL (0.93 - 1.70 ng/dL), and free T3 5 ng/dL (2.00 - 4.40 ng/dL). Blood cultures are pending. Which of the following is the next best step in the management of this patient?

## Choices:

1. Start methimazole
2. Initiate IV antibiotics and obtain thyroid ultrasound
3. Initiate PO antibiotics and obtain thyroid ultrasound
4. Obtain thyroid ultrasound

## Answer: 2 - Initiate IV antibiotics and obtain thyroid ultrasound

## Explanations:

- Infectious thyroiditis should be treated empirically with broad-spectrum antibiotics. The intravenous route should be preferred over oral due to severe illness.
- Any abscess, if present on the ultrasound, should be drained.
- The most common organisms causing acute bacterial thyroiditis are Staphylococcus and Streptococcus.
- Mycobacterial, fungal, and pneumocystis infections are more chronic in nature and are usually seen in the immunocompromised. Rarely thyrotoxicosis is seen in infectious thyroiditis.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Thyroiditis

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## Question 651: A 16-year-old patient sustained a severe head injury following a motor vehicle collision. He was being managed in a critical care unit. His laboratory investigation showed persistent hyponatremia. His hourly urine output was also on a lower side. There was also generalized noticeable swelling of his extremities. What is the next management plan in the patient in managing his hyponatremia?

## Choices:

1. Sodium replacement
2. Fludrocortisone
3. Fluid restriction
4. Fluid challenge test

## Answer: 3 - Fluid restriction

## Explanations:

- The patient has a characteristic presentation of a syndrome of inappropriate antidiuretic hormone (SIADH).
- Due to the excessive surge of antidiuretic hormone, there is inappropriate retention of water in the body, thereby leading to dilutional hyponatremia, decreased urine output, and the resultant weight gain.
- The pivotal step in managing SIADH is fluid restriction.
- Fludrocortisone and sodium replacement are justified only in cases of hyponatremia resulting from excessive renal sodium loss, such as in the cases of cerebral salt wasting.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hyponatremia

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## Question 652:

A 65-year-old male is seen in the pain clinic for refractory neuropathic pain. The patient has been diagnosed with diabetic neuropathy, and multiple medications such as duloxetine, amitriptyline, and pregabalin have failed to achieve sufficient pain control. It is decided to initiate him on a novel peptide agent derived from omega-conotoxin that acts at N-type calcium channels. What will be the appropriate route for the administration of this drug?

## Choices:

1. Intravenous
2. Intrathecal
3. Oral
4. Topical

## Answer: 2 - Intrathecal

## Explanations:

- The drug under consideration is most likely ziconotide. It is an N-type calcium channel blocker useful in the management of refractory pain conditions. Intrathecal administration is required for its action.
- Ziconotide acts at the dorsal spinal horn and prevents the release of neurotransmitters from primary afferent nerve terminals. Ziconotide does not cross the blood-brain barrier and has to be administered intrathecally.
- Automated ambulatory infusion systems are available for intrathecal administration. The pumps can be refilled periodically.
- Ziconotide is not currently recommended via any other route of administration. Since its site of action is the spinal cord, direct administration into the spinal canal is warranted.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Ziconotide

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## Question 653:

A 53-year-old woman presents to the gynecologist with complaints of persistent hot flashes and irritability for the past 18 months. Her last menstrual period was eight months ago, and since then, she has not been able to get a good night's sleep. She has associated dyspareunia and impatience for the past 12 months too. She has tried black cohosh for her symptoms but stopped it as she was afraid of its side effects. Her past medical history is significant for gastroesophageal reflux disease. Her recent most colonoscopy showed three polyps with the largest being 1.8 cm. She denies smoking but occasionally drinks alcohol. The examination is insignificant except for a round, smooth palpable breast lump, 2 cm in diameter, in the upper outer quadrant of the left breast. She tells the provider that she is not interested in any medicine that is given to depressed people as she does not want to get "dependent" on it. Which of the following is a contraindication for the 2nd line treatment of this condition?

## Choices:

1. Blood pressure of 150/95 mmHg or above
2. Consumption of alcohol
3. Colonic polyps
4. Palpable breast lump

## Answer: 4 - Palpable breast lump

## Explanations:

- This patient has post-menopausal symptoms. These include hot flashes, irritability, decreased sleep, dyspareunia, and impaired memory.
- The first-line treatment for postmenopausal symptoms is fluoxetine. The second-line treatment is hormone replacement therapy (HRT).
- Contraindications to HRT include thromboembolic diseases, breast lumps, uterine cancers, smoking in women >35, and blood pressure greater than 160/100 mmHg.
- This patient does not have a blood pressure of more than 160/100 mmHg. Consumption of alcohol is not a contraindication. Colon cancer rate decreases with the use of HRT, therefore the presence of polyps is not a contraindication.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hormone Replacement Therapy

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## Question 654:

A 62-year-old postmenopausal woman presents to the Bone Metabolism Clinic. She attained natural menopause at age 55. She was diagnosed with osteoporosis five years ago and was started on alendronate 70 mg once weekly and a pill that contains elemental calcium and vitamin D3 800 IU in combination daily. She has read that continued use of alendronate increases her risk for a fracture and would like to try a drug holiday. She is physically active and very involved in her neighborhood activities. She has no clinical or radiographic evidence of fracture. Her DEXA scan done five years ago showed a T score of -2.6 at the lumbar spine. At that time, her serum calcium, ionized calcium, PTH, and 25 hydroxyvitamin D were all normal. She has been seen yearly by her provider, and the DEXA scans and blood tests have been repeated at each visit. The T scores have shown serial improvement, and the blood tests have continued to be within normal limits. The current DEXA shows a lumbar spine T score of -1.8. The same blood tests are within normal limits. The clinician agrees to a drug holiday and insists on her continuing the calcium and vitamin D combination pill, and asks her to return in six months for a follow-up visit. Two months later, the patient changes her health insurance. The new insurer permits her to continue with her current provider but changes her pharmacy. At the new pharmacy, the pharmacist dispenses another brand of the calcium and vitamin D combination pill, telling her it has the same amount of vitamin D (800 IU), and it is an acceptable substitution. Follow-up labs reveal normal calcium, ionized calcium, and 25 OH vitamin D levels, but the PTH level is elevated. The elevated PTH level is confirmed with repeat testing. What is the best next best step in management?

## Choices:

1. Restore the original brand of calcium plus vitamin D combination
2. Restart alendronate
3. Order an ultrasound of the neck
4. Parathyroidectomy surgery

## Answer: 1 - Restore the original brand of calcium plus vitamin D combination

## Explanations:

- This patient has developed normocalcemic secondary hyperparathyroidism (nSHPT) due to low calcium in the new supplement. Patients who are on long-term bisphosphonates like alendronate retain the drug in their bones for many years, even after stopping it. The drug continues its action in preventing calcium mobilization from bones, and if not enough calcium is supplemented orally, PTH will increase in the face of normal serum calcium. If calcium intake is very low, hypocalcemia may ensue.
- The feedback increase in PTH will convert 25 hydroxyvitamin D to produce more 1,25 dihydroxy vitamin D, which cannot increase calcium absorption from the small intestines due to poor supplementation and inadequate intestinal calcium.
- This patient will need more than the usual amounts of calcium and vitamin D supplements to be continued even during the holiday period. Different brands may not have the same amounts of individual ingredients (calcium in this case), and careful substitution is vital for successful outcomes.
- Restarting alendronate will at best worsen the PTH elevation. The differential diagnosis is normocalcemic primary hyperparathyroidism (nPHPT) where nuclear scan and parathyroidectomy (PTX) are considerations. In this patient with alendronate bone retention, it is very unlikely and PTX will be disastrous. Poor supplementation of vitamin D and/or calcium in bisphosphonate-treated patients can cause nSHPT and is easily preventable.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Normocalcemic Hyperparathyroidism

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## Question 655:

A 65-year-old female patient presents to the hospital with complaints of leg cramps, muscle weakness, and headaches for the past two weeks. She also complains of passing larger volumes of urine than normal and feels extremely thirsty. A detailed past medical history reveals that she has recently been diagnosed as a case of hypertension and is on amlodipine. She says she is compliant with the medication and other lifestyle advice. Her vital signs show blood pressure 175/105 mmHg, pulse 85/min, and temperature 37 C (98.6 F). A physical examination is carried out which is unremarkable. Laboratory investigations reveal hemoglobin 13 g/dL, mean corpuscular volume 85 fL, serum sodium 147 mEq/L, and serum potassium 3.1 mEq/L. A CT scan of the abdomen and pelvis is in the plan. Which of the following prompted the provider to perform a CT scan in this patient?

## Choices:

1. Low potassium, high aldosterone, high plasma renin
2. Low potassium, low aldosterone, low plasma renin
3. Low potassium, high aldosterone, low plasma renin
4. High potassium, high aldosterone, low plasma renin

## Answer: 3 - Low potassium, high aldosterone, low plasma renin

## Explanations:

- The clinical scenario is consistent with the diagnosis of Conn syndrome or primary hyperaldosteronism. The chief presenting symptoms are sometimes vague like headaches and tiredness. It can also present with symptoms of diabetes secondary to hypokalemia-induced nephrogenic diabetes insipidus.
- Conn syndrome is usually diagnosed by biochemical testing. Laboratory investigations reveal increased levels of aldosterone, hypokalemia, and decreased levels of plasma renin levels.
- Imaging studies such as CT scans should only be carried out after biochemical studies show a strong suspicion of Conn syndrome. The reason behind this is that doing a CT scan can reveal many incidental lesions on the adrenal glands, which require biochemical testing to reach a diagnosis.
- The main presenting features of Conn syndrome are hypertension, which is uncontrolled even by two agents, along with hypokalemia, although potassium can be normal in about 30% cases.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Conn Syndrome

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## Question 656:

A 47-year-old African American woman with a history of type 2 diabetes mellitus and hypertension presents to the clinic for follow up. She is taking metformin and hydrochlorothiazide and was prescribed atorvastatin two months back. Her recent lab values show sodium 139 mmol/L, potassium 4.3 mmol/L, chloride 103 mmol/L, carbon dioxide 28 mmol/L, glucose 110 mg/dL, BUN 20 mg/dL, creatinine 0.9 mg/dL, GFR 90 mL/min/1.73 m2, calcium 9.6 mg/dL, albumin 4.3 g/dL, Alk-Phos 57 IU/L, AST 82 IU/L, ALT 81 IU/L, total bilirubin 1.0 mg/dL, total cholesterol 230 mg/dL, triglycerides 160 mg/dL, HDL 40 mg/dL, and LDL-C 120 mg/dL. Which of the following is the next best step in the management of this patient?

## Choices:

1. Discontinue atorvastatin
2. Continue current treatment
3. Replace atorvastatin with fenofibrate
4. Withhold atorvastatin

## Answer: 2 - Continue current treatment

## Explanations:

- An increase in transaminase levels to >3XULN (3 times the upper limit of normal) is an indication to withhold or discontinue treatment. There is no need to discontinue here.
- There is an increase in transaminase level here which is below 3X normal, hence atorvastatin can be continued here.
- Statins reduce ASCVD risk and are the first line of drugs for patients with increased risk. Fibrates are not the first line of drugs.
- There is an increase in transaminase levels which is below 3XULN, hence there is no need to withhold the treatment here.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Polygenic Hypercholesterolemia

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## Question 657:

A 21-year-old female with no notable medical history is referred to her primary care provider after being diagnosed with a spinal compression fracture. She denies any history of bone disease, previous fracture, or recent changes in activity level. She reports a 3-month history of an unintentional 20-pound (9 kg) weight loss, a “racing” sensation of the heart, and heat intolerance. She reports that over the last month, she has experienced three separate episodes of shortness of breath, nausea, and increased sweating. She denies loss of appetite, changes in diet, or activity level. She has a 10-year history of anxiety, which until recently had been well-controlled with paroxetine. In the clinic, she has a heart rate of 108 beats per minute, a blood pressure of 146/92 mmHg, and a temperature of 38.3 C (100.9.F). Serum thyroid-stimulating hormone (TSH) is found to be less than 0.01 microunit per ml (Normal range= 0.5-5.0). The cardiac examination reveals a tachycardic rate and regular rhythm without murmurs, rubs, or gallops. Which of the following lab results would be consistent with this patient’s presentation?

## Choices:

1. Increased free T4 and decreased alkaline phosphatase
2. Normal free T4 and increased alkaline phosphatase
3. Decreased free T4 and increased alkaline phosphatase
4. Increased level of both free T4 and alkaline phosphatase

## Answer: 4 - Increased level of both free T4 and alkaline phosphatase

## Explanations:

- This patient is presenting with classic signs and symptoms of primary hyperthyroidism.
- In primary hyperthyroidism, TSH will be suppressed, and free T4 will be elevated.
- Alkaline phosphatase is often elevated in hyperthyroidism secondary to increased bone turnover.
- This patient presented with an atraumatic spinal compression fracture for which she had no identifiable risk factors. It is likely that her bone density has been affected by her primary hyperthyroidism.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Osteoporosis Markers

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## Question 658:

A 16-year-old female presents to the emergency department with altered mental status. Her mother reports that the patient developed a fever and productive cough around 48 hours ago, and after that, she has vomited multiple times. Her past medical history is significant for type 1 diabetes mellitus. Her vitals on arrival show a blood pressure of 86/58 mmHg and a pulse rate of 120 beats per minute. On physical examination, she is drowsy but arousable, her skin turgor is decreased, and her skin is cold to touch. Her chest x-ray shows right lower lobe infiltrates. Laboratory analysis revealed undetectable cortisol level, elevated TSH level, and low free T4 level. The emergency provider ordered a repeat cortisol level and started levothyroxine along with intravenous (IV) fluids. Which is of the following complication can develop in this patient?

## Choices:

1. Adrenal crisis
2. Thyroid storm
3. Hypertensive crisis
4. Acute Pancreatitis

## Answer: 1 - Adrenal crisis

## Explanations:

- Type II polyglandular autoimmune syndrome (PAS-2) is diagnosed by occurrence in the same patient of at least 2 out of 3 manifestations, which includes primary adrenal insufficiency (Addison disease), autoimmune thyroid disease-causing Graves disease or hypothyroidism, and type 1 diabetes mellitus.
- Care should be taken to treat patients with thyroxine as this can precipitate life-threatening Addisonian crisis if the patient has undiagnosed adrenal insufficiency.
- In many cases, the diagnosis of PAS-2 may be delayed due to the heterogeneous presentation.
- Patients with PAS-2 and their family members should be monitored long-term due to the risk of development of organ-specific dysfunction over time.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Polyglandular Autoimmune Syndrome Type II

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## Question 659:

A 49-year-old woman presents with a two-month history of dysphagia and hoarseness. She has no past medical history. On examination, an 11×11 cm multinodular mass is observed in the anterior neck. She says this nodule has been there for the past 12 years, and she has not had any symptoms related to it. The nodules are spongy and do not move with deglutition. Another 5×4 cm mass is seen in the sternal notch. There is no cervical lymphadenopathy. Blood tests reveal thyroid-stimulating hormone 0.007 mIU/l (0.5-5) free thyroxine levels at 13.3 pmol/l and free T3 7.90 pmol/l (1.7-3.7). Thyroid scintigraphy reveals a functioning nodule of 1.7 × 19 cm in the superolateral right lobe. A CT scan of the neck shows an enlarged thyroid gland and an 8 x 7 x 6 cm mass in the left and a 7 x 4 x 3 cm on the right side occupying the entire lobes. Central calcifications were observed. Another expansile lytic mass of 5 x 4 x 4 cm was seen in the manubrium. What is the most likely diagnosis?

## Choices:

1. Non-toxic nodular goiter
2. Non-toxic non-nodular goiter
3. Toxic nodular goiter
4. Toxic non-nodular goiter

## Answer: 3 - Toxic nodular goiter

## Explanations:

- Plummer disorder is also known as toxic nodular goiter. The condition most often presents with hyperthyroidism. It is the second most common cause of hyperthyroidism in western nations. In Plummer disease, there is usually one single toxic nodule. The nodules typically become toxic when the size is greater than 2.5 cm.
- There is marked enlargement of the thyroid gland, firm thyroid nodules, and overproduction of thyroid hormone.
- Reports of the above patient clearly show a hyperthyroid profile and multiple nodules, which are toxic as they are greater than 2.5 cm.
- The nodules may also rarely produce symptoms of compression like dysphagia, hoarseness, and dyspnea. The condition is most common in older adults. Fine-needle aspiration cytology (FNAC) and histopathology are often performed to confirm the diagnosis.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Plummer Disease

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## Question 660: A boy was found to have hypogonadism and tall stature. Which of the following findings is most likely present in this child?

## Choices:

1. Difficulty walking
2. Webbed neck
3. 47,XYY
4. Poor muscular development

## Answer: 4 - Poor muscular development

## Explanations:

- The boy most likely has Klinefelter syndrome.
- These children have hypogonadism due to Leydig cell dysfunction and delayed sexual maturation.
- The karyotype is 47,XXY.
- Poor muscular development and language difficulties are common.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Klinefelter Syndrome

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## Question 661:

A 44-year-old male is referred for a biopsy of a left thyroid lobe nodule. The physical examination demonstrates a nonenlarged thyroid gland with a palpable nodule within the left thyroid lobe. Thyroid-stimulating hormone (TSH) and T3/T4 lab values are normal. A sonogram is done before the biopsy, which shows microcalcifications and a size of 2.4 centimeters. Which of the following describes the primary utility of a pre-procedure sonogram?

## Choices:

1. Allows for assessment of nodule morphology and vascularity
2. Helps with identification of a skin infection
3. Provides a Thyroid Imaging Reporting & Data System (TI-RAD) classification prior to biopsy
4. Allows to assess for ectopic tissue

## Answer: 1 - Allows for assessment of nodule morphology and vascularity

## Explanations:

- A pre-procedure sonogram allows for the assessment of regional vascularity. This allows for appropriate positioning and planning of needle trajectory. The presence of microcalcifications can tip you off that a nodule could potentially correspond to papillary thyroid cancer. Providing this differential to a cytopathologist can be helpful.
- The presence of an overlying skin infection implies that the procedure should be postponed until resolution of the infection. Cellulitis is a clinical diagnosis and does not require a sonogram.
- A TI-RAD classification is often already established before a patient presents for a biopsy. A pre-procedure sonogram is a brief evaluation to help with patient positioning and procedural planning of the fine needle biopsy (FNA).
- Various tests can be performed to assess for ectopic tissue, including nuclear medicine thyroid scintigraphy. There is no particular role for ectopic tissue evaluation during an FNA procedure.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Thyroid Nodule Biopsy

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## Question 662: A 43-year-old patient undergoes fine needle aspiration (FNA) of an incidentally found thyroid nodule. What is true regarding the pathology obtained via the fine needle aspiration?

## Choices:

1. Papillary thyroid cancer can be diagnosed using FNA
2. The Atlanta criteria are the gold standard for stratifying the FNA finding based on cytology.
3. Follicular thyroid cancer can be diagnosed using FNA
4. Studies showed no increase in diagnostic accuracy with FNA under ultrasound guidance.

## Answer: 1 - Papillary thyroid cancer can be diagnosed using FNA

## Explanations:

- Papillary carcinoma is the most common thyroid malignancy and can be diagnosed via an FNA.
- Papillary cancer will show the classic psammoma body and orphan Annie's eye on pathology.
- Ultrasound guidance will increase diagnostic accuracy for FNA.
- The Bethesda Criteria is used to stratify the FNA findings.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Thyroid Cancer

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## Question 663:

A 30-year-old woman is being evaluated for secondary hypertension. She has a history of high blood pressure since she was 19 years old, discovered during a routine physical. She does not complain of headaches, palpitations, chest pain, or pedal edema. Her medications include hydrochlorothiazide, amlodipine, hydralazine and lisnopril. Plasma metanephrines reveal a slightly elevated normetanephrine and normal metanephrine. CT scan of the abdomen shows normal adrenals. MIBG scan shows increased uptake in the left adrenal gland. Which of the following is the next best step in the management of this patient?

## Choices:

1. Evaluate for other causes of secondary hypertension
2. Prazosin
3. 24-hour urinary vanillyl mandelic acid
4. Reassurance

## Answer: 1 - Evaluate for other causes of secondary hypertension

## Explanations:

- Pheochromocytomas and paragangliomas are neural crest-derived neoplasms. A four-fold elevation in plasma metanephrines is indicative of pheochromocytoma or paraganglioma.
- Paragangliomas are diagnosed by increased uptake on the MIBG scan.
- MIBG scan can show an asymmetric increase in uptake of the adrenal gland.
- Other causes of false-positive MIBG scans are adrenomedullary hyperplasia, hemangiomas, carcinoids, and medullary thyroid cancer.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Nuclear Medicine Endocrine Assessment, Protocols, And Interpretation

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## Question 664:

A 30-day-old female infant is brought to the emergency department with lethargy, poor feeding, and vomiting. She is dehydrated and responds sluggishly. Her laboratory tests show hyponatremia, hyperkalemia, and metabolic acidosis. The urinary tetrahydrocortisol is low, while the serum 18 hydroxycorticosterone level is normal. Which of the following best describes this patient?

## Choices:

1. Aldosterone synthase deficiency type 1
2. Aldosterone synthase deficiency type 2
3. 21-hydroxylase deficiency
4. Cholesterol side-chain cleavage enzyme deficiency

## Answer: 1 - Aldosterone synthase deficiency type 1

## Explanations:

- The child has aldosterone synthase type 1 deficiency. Aldosterone deficiency leads to hyponatremia, hyperkalemia, and metabolic acidosis. This is accompanied by high renin, low to normal 18-hydroxycorticosterone, and low aldosterone or its urinary metabolite tetrahydro-aldosterone. There is elevated 18 hydroxycorticosterone and normal aldosterone in type 2 deficiency.
- The enzyme catalyzes the last three steps in aldosterone synthesis. The first is the hydroxylation of deoxycorticosterone (DOC) at position 11 beta to form corticosterone. The second is the hydroxylation at position 18 to form 18-hydroxycorticosterone, and the third, the oxidation at position 18 to aldosterone.
- Isolated deficiencies of aldosterone biosynthesis are caused by inactivating mutations in the CYP11B2 gene on chromosome 8q and inherited in an autosomal recessive pattern.
- Many children, when appropriately treated with salt substitution and fludrocortisone, will improve with age and may even undergo remission. Female infants with selective aldosterone synthase deficiency have normal genitalia, unlike salt-wasting congenital adrenal hyperplasia due to 21-hydroxylase deficiency. Since the deficiency is selective, the cortisol synthesis is unaffected, and hydrocortisone replacement is unnecessary. The 17 hydroxyprogesterone will be normal. Cholesterol side-chain cleavage enzyme deficiency will result in global adrenal failure.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hypoaldosteronism

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## Question 665:

A 35-year-old woman with a history of rheumatic mitral valve disease status-post mitral valve replacement with a mechanical valve presents to the clinic for help losing weight. She has already been exercising 3-4 times a week and initially noted weight loss of 8 pounds, but now her weight has stabilized, and she can not lose further weight. She is otherwise healthy and wishes to try medications to lose weight. She currently only takes warfarin. On physical exam, her BMI is 35 kg/m2, blood pressure is 135/82 mm Hg, heart rate is 88/min, and waist circumference is 38 inches. Her initial labs are unremarkable. Her INR is 2.6. Treatment with orlistat is being considered. Which of the following is the most appropriate recommendation for this patient if prescribed orlistat?

## Choices:

1. Check transaminases every 3 months
2. Take a multivitamin at bedtime a few hours away from the ingestion of the medication
3. Increase the dose of her warfarin
4. Check Urine analysis every 3 months

## Answer: 2 - Take a multivitamin at bedtime a few hours away from the ingestion of the medication

## Explanations:

- It is recommended for patients to take a multivitamin at bedtime due to the decreased absorption of fat-soluble vitamins related to chronic orlistat use. It should include the supplementation of vitamins A, D, E, and K.
- Due to decreased absorption of vitamin K and other liposoluble vitamins, in patients taking warfarin, orlistat could potentially increase the international normalized ratio (INR) and prothrombin time (PT).
- When starting orlistat in patients taking warfarin, it is recommended to decrease the warfarin dose while monitoring the INR.
- Although a few cases of hepatitis have been reported on patients using orlistat, a cause-effect relationship was not proven, since these patients were also taking other drugs or substances that could have been the cause of transaminitis. Therefore, despite a warning of rare cases of severe liver injury being present on the label of this drug, there is no recommendation of continuous monitoring of hepatic panel. Patients should be informed to report to the prescriber any symptoms suggestive of hepatic diseases, such as nausea, vomiting, or jaundice. Due to fat malabsorption, enteric calcium can bind to the fat to be excreted in the stools. As a consequence, intestinal oxalate becomes more available to be absorbed and then excreted in the urine. Excessive free oxalate can bind to calcium in the urine and cause calcium oxalate stones and nephrocalcinosis. Prescribers should inform patients about this potential side effect and encourage them to increase water consumption, but no specific screening or test is recommended to monitor that.

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## Research Concepts:

### Pharmacologic Therapy For Obesity

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## Question 666: A patient with diabetes mellitus with hemoptysis, fever, and dyspnea has a lung biopsy. The fresh sample shows hyphae branching at right angles with vascular invasion and necrosis. What is the most likely pathogen in the diagnosis?

## Choices:

1. Rhizopus
2. Apohysomyses
3. Cunninghamella
4. Histoplasma

## Answer: 1 - Rhizopus

## Explanations:

- The Rhizopus oryzae is the agent that most frequently causes mucormycosis. Rhizopus oryzae is the predominant pathogen; reaches 60% of all forms of mucormycosis, and is found in 90% of rhinocerebral cases
- The most frequent causative agents of mucormycosis are species of the genera "Rhizopus", "Rhizomucor" and "Cunninghamella", but some species of Apophysomyces, Saksenaea, Mucor and Absidia also cause this infection. The apohysomyses is an agent that can cause mucormycosis but it is not the main cause.
- The identification of the exact species that cause mucormycosis is not easy, due to the difficulty of isolating the fungus in culture media. However, regardless of the causative species and clinical presentation, therapeutic management is the same.
- You must identify that it is a case of mucormycosis which is characterized by being infrequent, and mainly affects patients with diabetes mellitus. Mucor can compromise lung, central nervous system, gastrointestinal tract, and skin.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Mucormycosis

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## Question 667:

A 1-month-old infant is admitted to the hospital due to failure to thrive. The patient had an unremarkable gestational development and birth, but shortly after birth developed severe foul-smelling diarrhea and vomiting. The mother also reports pallor and decreased activity. The physical exam reveals a hypoactive infant. Testing reveals abnormally low triglycerides and low-density lipoprotein (LDL). A blood film reveals red blood cells with thorny projections. Given the most likely diagnosis, what symptoms would this patient likely develop if left untreated?

## Choices:

1. Seizures
2. Diabetes mellitus
3. Cardiac arrhythmia
4. Poor movement coordination

## Answer: 4 - Poor movement coordination

## Explanations:

- Abetalipoproteinemia (ABL) is a rare neuroacanthocytosis syndrome that results from the autosomal recessive inheritance of mutated microsomal triglyceride transfer protein (MTTP) gene.
- Symptoms of ABL start at birth due to severe fat-soluble vitamin deficiency, including vitamins A, D, E, and K.
- Fat-soluble vitamin deficiency leads to a host of sequelae, including spinocerebellar ataxia, diminished deep tendon reflexes (DTRs), loss of proprioception, muscle weakness, and atypical retinal pigmentation.
- Treatment includes substantial vitamin supplementation, which may help prevent the development of significant comorbidity.

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## Research Concepts:

### Neuroacanthocytosis

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## Question 668:

A 65-year-old woman has elevated blood pressure that required three antihypertensive medications, followed by the addition of a fourth medication within the last year. Six months later, she is seen in the clinic complaining of post-menopausal vaginal bleeding. Which of the following drug classes is most likely the cause of the patient's condition?

## Choices:

1. Mineralocorticoid antagonist
2. Angiotensin-converting-enzyme inhibitor
3. Thiazide diuretics
4. Calcium channel blocker

## Answer: 1 - Mineralocorticoid antagonist

## Explanations:

- Mineralocorticoid antagonists, such as spironolactone, are potassium-sparing diuretics that can bind to androgen and progesterone receptors.
- In males, it can cause gynecomastia and loss of libido. In females, irregularity of menstrual periods and vaginal bleeding in post-menopausal can occur.
- Potassium-sparing diuretics are the recommended choice for a fourth-line agent.
- In females, angiotensin-converting-enzyme inhibitors can cause menstrual irregularities and is a category C drug in pregnancy. However, in post-menopausal women, potassium-sparing diuretics are the recommended choice for a fourth-line agent. Thiazide diuretics are used to treat resistant hypertension, cirrhosis, hyperaldosteronism, and hypokalemia. It is also used off-label to treat acne vulgaris and hirsutism. Resistant hypertension is defined by an elevated blood pressure not corrected despite being on optimal doses of three different antihypertensive agents, including a diuretic.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Spironolactone

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## Question 669:

A 49-year-old woman is brought to the emergency department by her neighbor after a seizure. The neighbor states that the patient has been complaining of headaches and weakness for several weeks now but has always hated seeing a doctor, so she never followed up on the complaints. A physical examination is noncontributory. Further laboratory evaluation reveals serum calcium of 15.4 mg/dl and a serum phosphate of 2 mg/dl. Chest radiography reveals multiple lung lesions. Which of the following conditions is most likely the cause of the finding in this patient?

## Choices:

1. Acute renal failure
2. Metastatic breast cancer
3. Vitamin D toxicity
4. Hyperthyroidism

## Answer: 2 - Metastatic breast cancer

## Explanations:

- Hypercalcemia is defined as serum calcium concentration, two standard deviations above the mean values. The normal serum calcium ranges from 8.8 mg/dL-10.8 mg/dL.
- The patient in the given scenario is experiencing symptoms of hypercalcemia, which can be summarized as "groans, bones, stones, moans, thrones and psychic overtones." This includes abdominal pain, nausea, vomiting, bone pain, fatigue, malaise, polyuria, polydipsia, constipation, lethargy, headache, confusion, depression, and memory loss.
- Calcium levels over 14 mg/dL are associated with malignancy. In patients with hypercalcemia associated with malignancy, the PTH-related peptide levels are elevated. The PTH related peptide increase levels of calcium by causing activation of the parathyroid hormone receptor, excessive bone resorption, and increased reabsorption of calcium from the distal convoluted tubules of the kidneys.
- The patient most likely has a primary lung malignancy that has metastasized to the breast and is causing hypercalcemia of malignancy.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hypercalcemia

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## Question 670:

A 49-year-old woman presents to the clinic for follow up of well-controlled hypertension, diabetes, and hypothyroidism. She has no personal history of atherosclerotic cardiovascular disease (ASCVD) or familial hypercholesterolemia. Her baseline LDL-C is 227 mg/dL, which improved to 136 mg/dL after taking atorvastatin and ezetimibe on maximum doses. Which of the following is the most appropriate recommendation for primary prevention of ASCVD in this patient?

## Choices:

1. Change atorvastatin to rosuvastatin
2. Calculate 10-year ASCVD risk score to determine further therapy
3. Add colesevelam
4. Add evolocumab

## Answer: 4 - Add evolocumab

## Explanations:

- PCSK9 inhibitors should be considered for primary ASCVD prevention in patients with baseline LDL-C greater than 220 mg/dL at baseline or LDL-C greater than 130 mg/dL on maximally tolerated statin and ezetimibe.
- PCSK9 inhibitors have demonstrated efficacy in primary ASCVD prevention in patient populations at high risk for ASCVD including familial hypercholesterolemia.
- When used concomitantly with statins, PCSK9 inhibitors have additive effects to reduce LDL-C levels.
- In patients with severe hypercholesterolemia (LDL-C greater than 190 mg/dL), a risk assessment is not necessary prior to starting lipid-lowering therapy since this patient population is inherently at high risk for ASCVD.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### PCSK9 Inhibitors

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## Question 671:

A 43-year-old male presents to the clinic for a follow-up regarding his new diagnosis of diabetes mellitus. His medical history includes hyperlipidemia, former tobacco use, and hypertension. His medications include atorvastatin 40 mg and lisinopril 40 mg. Vital signs today are as follows: blood pressure is 125/80, heart rate is 75, respiratory rate is 18, and oxygen saturation is 95% on room air. Body Mass Index is 35. Hemoglobin A1c is 7.5 and fasting blood glucose is 140. Physical exam reveals overweight body habitus and is unremarkable otherwise. He inquiries about a new medication he saw on an advertisement that he has heard may be helpful for someone with his newly diagnosed medical condition as well as his other co-morbidities. What is the mechanism of action of this class of medication?

## Choices:

1. Decreasing glucose reabsorption in renal tubules
2. Blocking calcium entry in vascular smooth muscles, therefore, causing vasodilation
3. Beta-1 adrenergic receptor blockade
4. Aldosterone antagonism

## Answer: 1 - Decreasing glucose reabsorption in renal tubules

## Explanations:

- Sodium-glucose cotransporter 2 inhibitors (SGLT-2) work by decreasing the amount of glucose that is reabsorbed which increases urinary glucose excretion, and therefore decreases hyperglycemia. They have been found to reduce hemoglobin A1C levels in patients with type 2 diabetes.
- Three SGLT-2 inhibitors, dapagliflozin, empagliflozin, and canagliflozin have been shown to have similar efficacies when it comes to glucose control and weight loss.
- Additionally, dapagliflozin, empagliflozin, and canagliflozin, in particular, have been reported to decrease systolic blood pressure by 3-5 mmHg and decrease this diastolic pressure by about 2-3 mmHg.
- The mechanism underlying the blood pressure lowering effects of SGLT 2 inhibitors can be described by the medication's ability to increase diuresis and decrease arterial stiffness.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### How Can I Help My Patients With Type 2 Diabetes Mellitus Minimize Cardiovascular Disease Risk?

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## Question 672: A 42-year-old man undergoes cardiovascular screening and is found to have a lipoprotein A level of 78 mg/dL (reference range 30 mg/dL). Which of the following therapies is most likely to improve cardiac outcomes for this patient the most?

## Choices:

1. Alirocumab
2. Atorvastatin
3. Ezetimibe
4. Niacin

## Answer: 1 - Alirocumab

## Explanations:

- Alirocumab is a PSCK9 inhibitor. It was shown that it can lower Lp(a) levels directly while simultaneously improving cardiac outcomes. Other medications, such as niacin, have improved Lp(a) levels but were unable to improve cardiac outcomes. The improvement of cardiac outcomes in the setting of Lp(a) lowering was independent of LDL levels.
- PSCK9 inhibitor drugs are used to treat refractory cases of high LDL and are often 2nd or 3rd line medications.
- Statins are generally first-line for treating dyslipidemia or hyperlipidemia. Ezetimibe is second-line.
- Niacin can lower Lp(a) levels but has not been shown to improve cardiac outcomes.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Lipoprotein A

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## Question 673:

A 58-year-old female with a previous history of transsphenoidal surgery for the management of Cushing disease seven years ago and bilateral adrenalectomy due to endocrinological failure despite a complete removal by the postoperative brain magnetic resonance imaging is evaluated by the endocrinologist and the neurosurgeon for the appearance of a new tumor in the pituitary fossa. Her adrenocorticotropic hormone had increased to 780 pmol/L (Normal: 1.3-16.7 pmol/L) and had developed significant skin hyperpigmentation. The magnetic resonance imaging performed last year only suggested a 3 mm abnormality within the pituitary gland. Still, the current study clearly shows an 18 mm lesion with contrast enhancement touching the chiasm. Which is the next best management in this patient?

## Choices:

1. Surgical removal of the tumor
2. Medical treatment with somatostatin-analogs
3. Medical treatment with dopamine agonists
4. Observation until next year magnetic resonance imaging to evaluate the growth pattern

## Answer: 1 - Surgical removal of the tumor

## Explanations:

- The initial recommended treatment for Nelson syndrome is the surgical removal of the tumor. Risk factors for developing Nelson syndrome have been studied in an attempt to achieve early detection and treatment. High levels of plasma ACTH one year after bilateral adrenalectomy have the strongest predictive capabilities. Fasting ACTH plasma levels above 154-220 pmol/L (700-1000 pg/ml) are predictive of Nelson's syndrome one year after bilateral adrenalectomy. Screening is done with the help of brain magnetic resonance imaging (MRI) to visualize the sellar area for pituitary tumors. If tumors are not detected, then a brain MRI should be performed at regular intervals. MRI may reveal a small tumor forming.
- Surgery can be performed microsurgical or endoscopically by the transsphenoidal route. Extensive tumors with lateral extensions may require a craniotomy. Endocrinological cure is achieved in approximately 50% of the cases. This is due in part by the infiltration of the cavernous sinus and extrasellar extension.
- Surgery can be complicated by postoperative hypopituitarism in 30% of the cases and permanent diabetes insipidus in 20% of the cases.
- Medical treatment is limited, and the results are not curative. Radiotherapy in the form of fractionated radiotherapy or stereotactic radiosurgery can be given to the tumor but is usually used in patients who can not undergo surgical resection. Sometimes, close clinical follow-up is recommended as many of the tumors do not develop clinically meaningful symptoms or have a slow growth pattern of less than 5 mm per year.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Nelson Syndrome

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## Question 674:

A 55-year-old patient presents to the clinic for evaluation. The patient was assigned female at birth but reports being in denial of their gender identity since age 7. He used to play with boys when he was a child and used to dress up like them. He suffered from depression since childhood. Since he did not have any family support, he did not seek any medical advice at that time. He is currently divorced and has 2 children. He lives alone after their children left home. One year ago, he established care with both a psychologist and psychiatrist after suffering an emotional breakdown while visiting a cousin in England. He was then referred to an endocrinologist who prescribed him a once-weekly intramuscular injection medication. Which of the following labs is most appropriate to be monitored in this patient?

## Choices:

1. Hemoglobin and hematocrit
2. White blood cell count
3. Creatinine
4. TSH level

## Answer: 1 - Hemoglobin and hematocrit

## Explanations:

- The patient in the clinical vignette has gender dysphoria (GD). He was started on cross hormone therapy (testosterone cypionate 100 mg weekly intramuscular injection). As per Endocrine Society guidelines 2017, hematocrit or hemoglobin needs to be measured at baseline and every 3 months for the first year and then one to two times a year in transgender males as testosterone increases the risk of erythrocytosis.
- Frequent monitoring of hemoglobin, hematocrit, liver function, cholesterol, and screening of diabetes should be done in all patients with GD on testosterone therapy. Testosterone therapy does not cause any significant abnormalities in the creatinine, white blood cells, or TSH level.
- Screening for osteoporosis should be conducted in transgender patients who stop testosterone treatment, are not compliant with hormone therapy, or develop risks for bone loss.
- In the transgender male, the key issues include maintaining testosterone levels in the physiologic normal male range and avoiding adverse events resulting from excess testosterone therapy, particularly erythrocytosis, sleep apnea, hypertension, excessive weight gain, salt retention, lipid changes, and excessive or cystic acne.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Gender Dysphoria

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## Question 675:

A 25-year-old female patient has absent periods for six months. She has occasional expressible breast discharge. She has a normal weight. She is not on any medications. The physical exam showed the expression of milk from both breasts. Lab results showed normal FSH, testosterone, morning cortisol, thyroid-stimulating hormone, and free T4 levels. Serum prolactin is elevated. What is the next step to define the cause of amenorrhea?

## Choices:

1. Karyotyping
2. Urine beta-human chorionic gonadotropin
3. MRI head
4. Ovarian ultrasound

## Answer: 2 - Urine beta-human chorionic gonadotropin

## Explanations:

- The most common cause of secondary amenorrhea is pregnancy.
- Primary ovarian failure is not a possibility given the normal FSH thus karyotype may not change the diagnosis.
- MRI head will be the second choice if the pregnancy test is normal.
- The patient does not have symptoms of hirsutism and has normal testosterone; thus, PCOS is not the diagnosis.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Pituitary Adenoma

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## Question 676: A 26-year-old woman is being evaluated for asymptomatic hypercalcemia. The patient does not report tiredness, thirst, frequent urination, bone pain, muscle weakness, or gastrointestinal symptoms. She has no significant past medical history. The physical examination is unremarkable. Initial investigations are shown below.

| | Patient value | Reference range |
|---|---|---|
| Parathyroid hormone | 75.44 pg/mL | 14-65 pg/mL |
| Adjusted calcium | 12 mg/dL | 8.5-10.2 mg/dL |
| 25-hydroxyvitamin D | 28.8 ng/mL | 25-80 ng/mL |
| Urinary calcium-creatinine | 0.02 | 0.14 |

DEXA scan shows normal bone density. A mutation of which of the following genes is most likely to be present in this patient?

## Choices:

1. SDHB gene
2. CDKN1B
3. TSC1 gene
4. VHL gene

## Answer: 2 - CDKN1B

## Explanations:

- CDKN1B gene mutation has been termed as MEN4.
- It accounts for 1% to 2% of MEN1 like syndrome without MEN1 mutation.
- It includes hyperparathyroidism, adrenal masses, pituitary adenoma, functional adenoma, carcinoid tumor, and Zollinger-Ellison syndrome with duodenal and pancreatic masses.
- SDHB gene is measured for paraganglioma syndrome. It is the second common type of familial paraganglioma. Hyperparathyroidism is not associated with SDHB. TSC1 gene is measured for tuberous sclerosis complex. It is an inherited neurocutaneous disorder. It is characterized by multiple benign hamartomas of the brain, eyes, heart, lung, liver, kidney, and skin. Hyperparathyroidism is not associated with tuberous sclerosis complex. VHL gene is measured from Von-Hippel-Lindau disease. Hyperparathyroidism is not associated with VHL disease. Common VHL-associated tumors include Hemangioblastomas of the brain, spine, retinal, Renal cell carcinomas, and Pheochromocytomas.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Multiple Endocrine Neoplasias Type 4

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## Question 677:

A 40-year-old man with a recent history of obesity presents with a chief complaint of impotence for the past year. He has also noticed a decrease in sexual desire and the ability to concentrate on tasks. The patient started exogenous testosterone injections six months ago, which he states have helped a little, but he is frustrated with his continued symptoms. He has no history of diabetes mellitus or cardiovascular disease. Physical examination shows testicular atrophy and lack of axillary hair growth. His laboratory shows testosterone: 245 ng/dL (normal 300 - 1,000 ng/dL), prolactin: 10 ng/mL (normal 2 - 18 ng/mL), estradiol: 60 pg/mL (normal 10 - 50 pg/mL), FSH: 1.2 IU/L (normal 1.5 - 12.4 IU/L), LH: 0.8 IU/L (normal 1.24 - 7.8 IU/L). Given the patient's most likely diagnosis, what is the mechanism of action of a drug that is appropriate for adjuvant treatment of this patient?

## Choices:

1. Increases testosterone production.
2. Prevents androgen conversion.
3. Blocks alpha-adrenergic receptors.
4. Inhibits the enzyme 5-alpha reductase.

## Answer: 2 - Prevents androgen conversion.

## Explanations:

- In obese men, there is an increase in the conversion of testosterone to estradiol in the adipose tissue, leading to an increase in estrogen levels. This leads to a suppression of LH and FSH, which causes secondary hypogonadism, also called hypogonadotropic hypogonadism. Lab results for secondary hypogonadism will show decreased testosterone and normal or decreased levels of LH and FSH.
- Symptoms of hypogonadism include reduced sexual desire, impotence, loss of axillary or pubic hair, a decline in testicular size, hot flashes, and decreased sperm count. Patients may also present with depressed mood, decreased ability to concentrate, and obesity. Obesity and diabetes are the most common causes of hypogonadism; other potential causes include Kallman syndrome, pituitary disorders, trauma, stress, and surgery.
- The first-line treatment of secondary hypogonadism is exogenous testosterone. However, aromatase inhibitors are indicated as a second-line treatment to help reduce estrogen levels in patients already taking testosterone with continued symptoms. Aromatase inhibitors decrease estrogen levels and increase FSH and LH production from the pituitary. Aromatase is the enzyme responsible for the conversion of testosterone to estradiol and is the key enzyme in estrogen synthesis.
- Although aromatase inhibitors decrease the conversion of testosterone and therefore increase testosterone levels, they do not increase the production of testosterone. There are currently no pharmacologic agents available to increase the production of testosterone. There is no role of the alpha-adrenergic receptor blockers in the treatment of male hypogonadism, and these are used in the treatment of benign prostatic hyperplasia (BPH). BPH would present with symptoms such as difficulty urinating, not symptoms of hypogonadism. Inhibiting 5-alpha reductase decreases testosterone levels and therefore has no role in the treatment of male hypogonadism

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Aromatase Inhibitors

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## Question 678:

A 16-year-old boy presents to his primary provider for a well-child check. His height is at 80th percentile, weight at 50th percentile, and mid-parental target height is 50th percentile. He has always had some difficulty with verbal processing and language delay but is in mainstream classes at school. He has a fine intention tremor. On pubertal exam, he has Tanner IV pubic hair and 4 mL testes bilaterally. For what malignancy is this patient at increased risk?

## Choices:

1. Papillary thyroid carcinoma
2. Renal carcinoma
3. Extragonadal germ cell tumor
4. Optic glioma

## Answer: 3 - Extragonadal germ cell tumor

## Explanations:

- Patients with Klinefelter syndrome are at higher risk for breast cancer, extragonadal germ cell tumor, and non-Hodgkin lymphoma.
- Despite the increased risks of certain cancers, the overall frequency is still quite low and routine screening is not recommended.
- In patients with Klinefelter syndrome, breast cancer most commonly occurs in adulthood, extragonadal germ cell tumors peak in adolescence and present as precocious puberty in boys less than 10 years old, and as cough, dyspnea, or chest pain in adolescents or adults, given the most common location is in the mediastinum.
- Childhood leukemias are still the most common malignancies in children with Klinefelter syndrome, though they are not more likely than children without Klinefelter syndrome.

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## Research Concepts:

### Klinefelter Syndrome

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## Question 679:

A 45-year-old woman presents to the emergency department for an episode of confusion, nervousness, sweating, and palpitations that occurred one hour ago at home while she was preparing dinner. She has had five similar episodes over the past three weeks. According to the patient, each episode lasts three to five minutes and is relieved by ingesting solid food or fruit juice. Her blood pressure is 141/84 mmHg, pulse 86 beats/minute, and respiratory rate 18 breaths/minute. The examination is within normal limits. Blood work shows a random blood glucose level of 131 mg/dl, HbA1c of 5.6%, and a TSH level of 1 mIU/L. While in the examination room, the patient suddenly becomes tremulous and complains of palpitations and blurred vision. A cardiac monitor is urgently attached to the patient, which reveals a pulse of 123 beats/minute. Blood glucose is measured via the finger-stick and reveals hypoglycemia. The patient is quickly given a bolus of 25% dextrose orally, which rapidly improves her symptoms. The patient is admitted to the hospital and is further tested with a 72-hour fasting test, which is stopped after 36 hours because of another episode of sweating and palpitations that lasts 10 minutes. A plasma glucose level of 55 mg/dl is recorded during the episode. What is the best next step in the management of this patient's suspected condition?

## Choices:

1. Measure blood levels of insulin, proinsulin, and C-peptide during symptomatic episodes
2. Measure plasma fractionated metanephrines levels when patient is stable
3. MRI of the pituitary gland
4. CT scan of the pancreas

## Answer: 1 - Measure blood levels of insulin, proinsulin, and C-peptide during symptomatic episodes

## Explanations:

- Whipple triad consists of low blood glucose, symptoms of hypoglycemia (e.g., lethargy, syncope, diplopia), and resolution of symptoms after normalization of plasma glucose levels. It is seen in patients with insulinoma.
- If hypoglycemia is confirmed by measuring blood glucose levels when the patient is symptomatic, it should be followed by a 72-hour fasting test. If hypoglycemia is established during the 72-hour fasting test, blood levels of insulin, proinsulin, and C-peptide are measured to distinguish insulinoma from factitious disorder.
- In patients with insulinoma, levels of insulin, proinsulin, and C-peptide will be high.
- For initial therapy of patients with benign, solitary insulinoma, surgical excision of the tumor is recommended.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Insulinoma

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## Question 680:

A 50-year-old patient presents to the clinic for evaluation. They were assigned the male gender at birth but experienced a persistent desire to be female since age 5. The patient is married, has 2 children, and is taking sertraline for depression. The patient recalls playing with dolls and dressing in feminine clothing but was not allowed to express themself as a female in public. The patient experienced adolescent bullying and did not fit in with their peers. The patient is expressing the desire to be female. Which of the following is the next best step in the management of this patient?

## Choices:

1. Start estradiol therapy
2. Start spironolactone therapy
3. Baseline laboratory tests including blood counts, electrolytes, liver enzymes, and lipid profile
4. Gonadectomy

## Answer: 3 - Baseline laboratory tests including blood counts, electrolytes, liver enzymes, and lipid profile

## Explanations:

- The above patient has gender dysphoria (GD). Patients usually present to their primary care providers, endocrinologists, or mental health provider. Once the diagnosis is confirmed, the best next step is to get baseline laboratory tests, including CBC, electrolytes, liver enzymes, prolactin, fasting blood glucose, and lipid profile before starting gender-affirming hormone therapy (HT). Additionally, clinicians should counsel the patient about the risks and benefits of HT, including the expectations and the timing of physical changes.
- The Endocrine Society Clinical Practice Guidelines published in 2017 recommend transgender female HT consist of anti-androgen treatment (e.g., spironolactone, GnRH agonists) and estrogen (17-beta-estradiol). Hyperkalemia and hepatoxicity are common side effects of spironolactone. Baseline laboratory tests are required.
- In order to meet the criteria for surgical treatment, the patient should be on one year of continuous hormone therapy and living in the desired gender role.
- A marked incongruence between one's experienced/expressed gender and assigned gender, of at least 6 months' duration, is an essential part to diagnose GD. This condition is associated with clinically significant distress or impairment in social, occupational, or other important areas of functioning.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Gender Dysphoria

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## Question 681: A 58-year-old woman presents to her family doctor with a chief complaint of eye dryness. She has a history of Graves disease. Her eye exam reveals mild proptosis, lid retraction, and some conjunctival erythema bilaterally. What is the best initial therapy for this patient's eye problem?

## Choices:

1. Supportive measures including lubricating eye drops
2. Emergent ophthalmology referral
3. IV steroids
4. Oral steroids

## Answer: 1 - Supportive measures including lubricating eye drops

## Explanations:

- The patient has mild Graves orbitopathy that would initially only require supportive treatment.
- Managing someone with a mild disease that is not clinically active includes supportive measures to ensure adequate eye lubrication such as eye drops, eye patches to avoid exposure keratopathy, and address patient comfort, prisms potentially for diplopia if present and elevating the head of the bed to assist with swelling.
- Selenium has also been described for use in mild Graves orbitopathy, but its effect is not completely validated in selenium-rich environments.
- Steroid use, either oral or IV, only plays a role in those patients with clinically active moderate-to-severe Graves orbitopathy.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Graves Orbitopathy

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## Question 682:

A 55-year-old male executive with a past medical history of type 2 diabetes mellitus, hypertension, and hyperlipidemia presented to his primary medical doctor for a routine follow up. He reports to his physician that he has several episodes of low blood glucose at home. He checks his blood glucose 3-4 times daily, and the readings are highly variable for the past 4 months. He has felt diaphoretic and weak on several occasions. He has been taking 35 unis of insulin glargine daily for the past year. Fasting blood glucose has been 50-60 mg/dl. His postprandial blood glucose has been 220-250 mg/dl. His HbA1c has worsened from 7% to 10.1% in the past year. He has gained 10 pounds. Lab work reveals a creatinine of 0.9 mg/dl, TSH 5 mIU/L, AST 270 U/L, ALT 305 U/L, ALP 188 U/L, and total bilirubin 0.8 mg/dl. Physical examination reveals multiple sites of fatty tissue swelling at injection sites. He is compliant with diet and insulin dosing. What is the next step in the management of this patient?

## Choices:

1. Advise weight loss
2. Increase Lantus to 40 units
3. Advise short-acting insulin instead of long-acting
4. Decrease insulin dosing by 10% and rotate injection sites

## Answer: 4 - Decrease insulin dosing by 10% and rotate injection sites

## Explanations:

- Lipodystrophy associated with insulin treatment can result in unpredictable blood glucose concentrations and unexplained episodes of hypoglycemia.
- Patients should be advised to rotate injection sites and not inject in areas directly involved with lipodystrophy. Patients should also be advised against the frequent use of the same insulin needle.
- Patients taking insulin should receive a detailed physical examination. An inspection alone is not sufficient and concerned areas should be palpated to evaluate for lipohypertrophy.
- Preventing lipodystrophy is important as treatment options are limited.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Lipodystrophies

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## Question 683:

A 40-years-old man presents to the clinic for an annual check-up. He successfully reduced his body weight from 112 kg to 77 kg with an improvement in his BMI from 27 kg/$m^2$ to 24.1 kg/$m^2$. His initial body fat mass monitored by dual-energy X-ray absorptiometry (DEXA) indicated high baseline fat mass (9 kg/$m^2$). Also, his reports indicated high blood pressure (135/89 mmHg), normal insulin (11 microU/mL) levels, and normal blood sugar (fasting blood glucose 105 mg/dL) levels. His follow-up after one year is significant for 3 kg weight gain, and two years follow up indicates that he has improved his weight loss and maintained it to a final of 75 kg. His BMI also improved to 23.9. Which of the following is the strongest contributing factor to weight maintenance after this patient's weight loss regime?

## Choices:

1. Normal baseline insulin level
2. High baseline fat mass
3. High initial BMI
4. Normal baseline blood sugar

## Answer: 2 - High baseline fat mass

## Explanations:

- A high baseline fat mass helps to succeed in maintaining weight after weight loss easily.
- Individuals with higher fat mass can lose weight without increasing stress in adipocytes and also retain their fat-free mass.
- High baseline body fat content relates to a higher ratio of fat mass/fat-free mass in the lost weight. Hence, individuals with a higher baseline fat mass are at a lesser risk for weight regain.
- The fat-free mass has a specific role in weight maintenance. High-fat mass also helps to preserve fat-free mass during the weight loss process.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Metabolic Consequences Of Weight Reduction

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## Question 684:

A 22-year-old woman presents to the clinic for chronic fatigue and vague abdominal pain, on and off associated with food. She has previously seen two different providers and was not able to get a diagnosis. She lost her father in childhood. Her symptoms started almost a year ago. She has no chronic medical problems, takes no medication, does not smoke, drinks alcohol socially, and denies any illicit drug use. Physical examination is normal. Complete blood count, comprehensive metabolic panel, and urinalysis show no abnormality. A pregnancy test is negative. She had an abdominal ultrasound and computed tomography done three months ago that showed no abnormality. Which of the following is the next best test to confirm her diagnosis?

## Choices:

1. MRI of the abdomen and pelvis
2. Fasting lipid profile
3. Genetic testing
4. Fecal occult blood

## Answer: 2 - Fasting lipid profile

## Explanations:

- Familial chylomicronemia syndrome should be suspected in a patient with a history of vague abdominal pain with fatigue with no other signs and symptoms. Moreover, she lost her father in childhood. It can be inferred that he had a sudden death at a young age, most likely due to hyperlipidemia.
- This patient already has workup done to rule out abdominal pathologies, and everything has been negative so far. The next best step would be to check a fasting lipid profile.
- Most patients with familial chylomicronemia would have no specific symptoms and can often be missed requiring frequent visits.
- MRI is not necessary for this patient. Although genetic testing would be the best diagnostic test, it is not the next best step as it is available only in specialized laboratories. Her CBC is normal, and therefore, there is no suspicion of blood loss in this patient, and testing for fecal occult blood is not required at this point.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Familial Hyperchylomicronemia Syndrome

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## Question 685:

A 35-year-old female with a history of newly diagnosed hypertension arrives in the clinic to establish her diagnosis. On examination, she has a round face, subclavicular fat and purple striae on the abdomen. Her blood pressure is 130/90 mm Hg, and her body mass index (BMI) is 27 kg/m2. She is sexually active with her husband, and her last menstrual cycle was two weeks back. Her TSH is above 4.5 mU/L, and both ACTH and 24-hour urinary free cortisol levels are elevated at three times the upper limit of normal. What is the next best step in the diagnosis of this patient?

## Choices:

1. Abdominal CT
2. Pituitary MRI
3. Free T4
4. No need for further testing

## Answer: 2 - Pituitary MRI

## Explanations:

- A young patient with newly diagnosed hypertension should be screened for secondary causes or causes contributing to her high blood pressure. Causes of secondary hypertension include renovascular hypertension, hypothyroidism/hyperthyroidism, pheochromocytoma, coarctation of the aorta and certain medications.
- The patient has features of Cushing syndrome (CS) and both the ACTH and urinary free cortisol are high, which leads to the diagnosis of CS. Further tests should be done to establish the cause of CS. As the patient has high ACTH, the cause of CS is likely central and pituitary MRI should be done to look for pituitary adenoma.
- Patients with ACTH-independent disease (those with low values of ACTH) and hypercortisolism require abdominal CT to look for adrenal tumor or hyperplasia.
- The patient has normal TSH, free T4 is not indicated at this moment.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Cushing Disease

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## Question 686: A 25-year-old male presents to the clinic with increased urination, polydipsia, and weight loss. He has a history of intellectual disability, short stature, and a malar rash with sun exposure. As a baby, he had severe gastroesophageal reflux and malnutrition, requiring a gastrostomy tube. His sister has a similar history. Which lab test should be ordered?

## Choices:

1. Complete blood count
2. Erythrocyte sedimentation rate (ESR)
3. Serum creatinine
4. Hemoglobin A1C

## Answer: 4 - Hemoglobin A1C

## Explanations:

- Patients with Bloom syndrome may develop non-insulin-dependent diabetes mellitus.
- Late-onset complications of diabetes, such as diabetic retinopathy, are less likely to be present due to the early mortality in patients with Bloom syndrome.
- A multidisciplinary approach to management is necessary for Bloom syndrome due to the increased risk of endocrinopathies, sinopulmonary infections, malignancies, and intellectual disability.
- Complete blood count with differential will show low normal lymphocytes, indicative of mild immunodeficiency. However, the patient in the question stem is exhibiting signs of diabetes mellitus.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Bloom Syndrome

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## Question 687:

A 59-year-old woman presents to the clinic with a cough, shortness of breath on exertion, and fatigue. She has no medical conditions and takes no medications. Physical examination reveals blood pressure 135/75 mmHg, heart rate 95/min, respiratory rate 20/min, temperature 100.1 F (37.8 C), and oxygen saturation 98% on room air. Some skin lesions are noted on her right thigh and abdomen. An initial set of investigations is shown below.

| | Patient value | Reference range |
|---|---|---|
| Calcium | 12 mg/dL | 8.5-10.2 mg/dL |
| Serum creatinine | 0.9 mg/dL | 0.8-1.4 mg/dL |
| Phosphorus | 3.5 mg/dL | 3.5-5 mg/dL |
| Parathyroid hormone | 10 pg/mL | 14-65 pg/mL |
| Alkaline phosphatase | 40 IU/L | 44-147 IU/L |

Her chest X-ray reveals bilateral pulmonary infiltrates with hilar lymphadenopathy. Which of the following is the next best test in the evaluation of this patient?

## Choices:

1. Parathyroid hormone-related peptide
2. Vitamin D level
3. Alpha-fetoprotein level
4. Cortisol level

## Answer: 2 - Vitamin D level

## Explanations:

- This is a case of a patient with sarcoidosis. Therefore the next best step in diagnosis is to check vitamin D level. The mechanism behind abnormal calcium regulation in patients with sarcoidosis is not fully understood. However, studies show that about 30%-50% of patients with sarcoidosis have hypercalciuria, and about 10% have hypercalcemia. Increased Intestinal calcium induced by high serum vitamin D levels is the culprit behind this abnormality.
- Normally, the conversion of 25-hydroxyvitamin D to 1,25-dihydroxyvitamin D occurs physiologically under PTH regulation (6688814). However, in granulomatous diseases like sarcoidosis, activated macrophages, mostly in the lungs and lymph nodes, produce 1,25-dihydroxyvitamin D independent of PTH.
- Parathyroid hormone-related peptide is often elevated in hypercalcemia related to malignancy. PTHrP and PTH both act on the same receptors.
- Elevated alpha-fetoprotein and cortisol levels are not related to hypercalcemia.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Resistant Hypercalcemia

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## Question 688:

A 16-year-old with a BMI of 65% is seen for an annual check-up. Her family history reveals that the mother has been on rosuvastatin since 22 years of age. Her maternal grandfather had a massive heart attack at 48 years which needed coronary bypass surgery. The provider obtains fasting labs that showed: total cholesterol- 298 mg/dl, triglycerides- 62 mg/dl, HDL cholesterol- 50 mg/dl, LDL cholesterol of 246 mg/dl, TSH of 1.5 mIU/ml, and free T4 of 1.7 ng/dl. The family implemented changes to increase the physical activity of the child to one hour every day, increase dietary fiber, and reduce saturated fats. Repeat lipid panel 6 months later shows total cholesterol of 269 mg/dl, LDL cholesterol of 224 mg/dl, and HDL cholesterol of 50 mg/dl. What is the next step in management?

## Choices:

1. Start atorvastatin at 5 mg daily
2. Continue dietary changes
3. Increase physical activity to 2 hours per day
4. Start levothyroxine at 25 mcg daily

## Answer: 1 - Start atorvastatin at 5 mg daily

## Explanations:

- The diagnosis for the patient is familial hypercholesterolemia since the BMI of the patient is normal, there is a family history of hypercholesterolemia, and LDL cholesterol is consistently elevated over 190 mg/dl even after 6 months of diet and lifestyle changes.
- The first-line therapy of primary prevention in pediatrics is statin treatment.
- Statins are typically started in patients more than 10 years. Statins can be started at 8 years if there is a positive family history of premature cardiovascular disease in multiple first-degree relatives or the presence of additional risk factors.
- Baseline liver functions and creatinine kinase can be checked prior to initiating statin therapy.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Pediatric Dyslipidemia

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## Question 689:

A 45-year-old Hispanic woman presents to the clinic with complaints of anxiety, tachycardia, diarrhea, profuse sweating, and loss of hair. She underwent surgical resection of a thyroid tumor one year ago. Her ultrasound at that time showed solid hypoechoic nodules with microcalcifications, poorly defined margins, and vascular patterns with the dominant intranodular flow. Her pathology reports confirmed follicular cells that did not have the nuclear atypia. She was then lost to follow up. She said she had to travel back to her country and was of the impression that after this surgery, she was cured of the disease. She has not seen any doctors since then. Which of the following treatments is most likely to have prevented this patient's current condition?

## Choices:

1. Neck radiotherapy
2. Radioactive iodine-131 ablation
3. Immediate thyroid hormone replacement therapy
4. Tyrosine kinase inhibitor therapy

## Answer: 2 - Radioactive iodine-131 ablation

## Explanations:

- Follicular thyroid carcinoma with invasive characteristics is treated with total thyroidectomy, radioiodine ablation, and thyrotropin suppressing medications.
- After surgery, radioactive iodine is administered. This will destroy any residual thyroid tissue and occult cancer cells and also allow for the detection of any persistent cancer.
- A study reported a 2.1 fold increase of follicular thyroid cancer recurrence in those who did not undergo radioiodine ablation compared to those who did, which is why the standard treatment recommendation is total thyroidectomy followed by radioiodine radiation.
- Most patients require ablation with I-131 following surgery to eliminate the risk of recurrence.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Follicular Thyroid Cancer

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## Question 690:

A 17-year-old man comes to the hospital with complaints of an episode of dizziness, confusion, and inability to concentrate. The episode occurred 1 hour ago. It lasted for about 4 minutes and was resolved after he had some orange juice. The patient has never had such symptoms before. He also complains of increased episodes of headache, thirst, urination, and intermittent abdominal pain over the past 9 months. The patient does not drink, smoke, or use any medicine. Physical examination reveals a tall, slender guy comfortably sitting in a chair. Laboratory studies show a random blood glucose level of 55 mg/dl, free plasma calcium levels of 10.8 mg/dl, elevated levels of parathyroid hormone, elevated levels of insulin, elevated proinsulin, and elevated c-peptide. The patient was put for adoption as an infant and is not sure of his biological parent's past medical history. What is the most likely diagnosis?

## Choices:

1. Multiple endocrine neoplasia type 1
2. Multiple endocrine neoplasia type 2A
3. Multiple endocrine neoplasia type 2B
4. An isolated case of insulinoma

## Answer: 1 - Multiple endocrine neoplasia type 1

## Explanations:

- The common clinical manifestation of an insulinoma is fasting hypoglycemia, with discrete episodes of neuroglycopenic symptoms that may or may not be preceded by sympathoadrenal (autonomic) symptoms. However, postprandial hypoglycemia may be a feature or even the sole manifestation of hypoglycemia in some patients.
- Patients with insulinoma often have multiple endocrine neoplasia type 1. Multiple endocrine neoplasia type 1 (MEN1) is an autosomal dominant predisposition to tumors of the parathyroid glands, anterior pituitary, and enteropancreatic endocrine cells.
- Insulinomas are the most common pancreatic endocrine tumors.
- About 89% of patients present with hypoglycemia, diplopia, and blurred vision.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Insulinoma

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## Question 691:

A 27-year-old female patient had been complaining of hearing loss and pulsatile tinnitus in the right ear for six months. On examination, she has a significant conductive hearing loss on the right ear with a retro auricular bruit. She is noted to have excessive sweating of the hands and cervical area. Blood pressure is 130/90 mmHg with a heart rate of 110 beats per minute. There is noticeable facial flushing. Magnetic resonance imaging with intravenous contrast-enhanced shows a 4 cm enhancing lesion was extending from the jugular bulb to the middle ear with a characteristic salt-and-pepper appearance on T1 and T2 weighted images. The neurosurgeon discussed the patient's diagnosis and surgical options, and she is scheduled to have subtotal resection and adjuvant radiosurgery. Which is the next best step before the surgical procedure?

## Choices:

1. Embolization 24 to 72 hours before surgery
2. Radiosurgery 3 to 4 weeks before surgery
3. Balloon test occlusion studies
4. 24-hour urinary collection for catecholamines and metanephrines

## Answer: 4 - 24-hour urinary collection for catecholamines and metanephrines

## Explanations:

- Up to 1 to 3% of glomus tumor cases have secretion of catecholamines. Signs and symptoms of a hormonally active tumor include labile hypertension, increased heart rate, headache, excessive sweating, tremors, as well as facial flushing; these mandate a comprehensive evaluation.
- With high enough levels of catecholamines, pheochromocytoma-like symptoms may develop, resulting in systemic effects.
- Laboratory workup (24-hour urinary collection for catecholamines and metanephrines) is mandatory for any patient undergoing a surgical approach.
- Preoperative embolization of the tumor can lead to a decrease in the duration of surgery, as well as a reduction of operative estimated blood loss. In this patient, laboratory workup is necessary before the embolizations as she is presenting symptoms of active catecholamine hormone secretion, which can complicate the embolization and surgery.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Glomus Jugulare

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## Question 692:

A 55-year-old female with type 2 diabetes mellitus presents for follow-up. Her provider made changes to her diabetes regimen during her previous visit. She was on metformin, liraglutide, and repaglinide, and her provider replaced repaglinide with glipizide. The patient misunderstood the instructions and started taking glipizide along with metformin, liraglutide, and repaglinide. Today, she reports episodes of hypoglycemia. Which of the following combinations is most likely contributing to her hypoglycemia?

## Choices:

1. Metformin plus repaglinide
2. Metformin plus liraglutide
3. Glipizide plus repaglinide
4. Glipizide plus liraglutide

## Answer: 3 - Glipizide plus repaglinide

## Explanations:

- Sulfonylureas (i.e., glipizide) may be combined with any other oral antidiabetic medication class except meglitinides (i.e., repaglinide).
- Sulfonylureas stimulate insulin secretion from the pancreatic beta cells regardless of serum glucose levels. Repaglinide also stimulates insulin secretion from the pancreatic beta cells, but the insulin release is glucose-dependent.
- The combination of glipizide and repaglinide may have an enhanced hypoglycemic effect leading to hypoglycemic episodes.
- Metformin and liraglutide are unlikely to cause hypoglycemia. Therefore, the combination of metformin, liraglutide, and glipizide may be used.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Sulfonylureas

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## Question 693:

A 24-year-old female is brought to the clinic with complaints of ten mucocutaneous lesions on various parts of her body. She is intellectually disabled and has a goiter. Physical examination reveals an enlarged head, skin tags in armpits and neck in addition to diffuse, painless, moveable swellings on her upper back. MRI scan detects diffuse hypertrophy of the granular layer of the cerebellum. Which of the following is considered one of the key parts of the management of this disease?

## Choices:

1. Treating tricholemmomas
2. Cognitive support
3. Wound care
4. Screening for malignancies

## Answer: 4 - Screening for malignancies

## Explanations:

- Genetic counseling is beneficial, especially since other family members may also be diagnosed with the disease. Importantly, referrals to system-specific specialists such as OBGYN, gastroenterologist, endocrinologist, dermatologist, neurologist, or radiologist for screening imaging and tests are recommended.
- Cowden disease, also known as Cowden syndrome or multiple hamartoma syndrome, is a genodermatosis originally described in 1963 by Lloyd and Dennis. Patients having two of the following major criteria more likely to be diagnosed with Cowden disease: Lhermitte-Duclos disease, Thyroid carcinoma, Macrocephaly, Breast cancer.
- Patients with one major and three of the following minor criteria or four minor criteria may be diagnosed with Cowden disease: Genitourinary tumors or malformations, Lipomas, Fibromas, Mental retardation, Fibrocystic disease of the breast, Gastrointestinal hamartomas, thyroid lesions such as goiter. Mucocutaneous lesions or palmoplantar keratosis can meet the criteria alone if six or more are present.
- Cutaneous lesions may be treated with various modalities such as surgical excision, 5-fluorouracil, mTOR inhibitors (currently under investigation), laser, isotretinoin, or other destructive methods.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Cowden Disease

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## Question 694:

A 56-year-old female presents with hot flashes. Her menstruation ceased a year ago. She noticed that her hot flashes are associated with palpitations, chills, shivering, anxiety, and decreased libido. Her past medical history is significant for breast cancer and she is currently taking tamoxifen. The physical exam shows a pale vagina which lacks rugae, decreased pubic hair, narrowing of the introitus, and loss of elasticity of the external genitalia. Which of the following is the best treatment option for her condition?

## Choices:

1. Venlafaxine XR 75 mg per day
2. Use evening primrose oil twice a day
3. Paroxetine mesylate 7.5 mg per day
4. Start yoga and meditation to relieve stress

## Answer: 1 - Venlafaxine XR 75 mg per day

## Explanations:

- The postmenopausal syndrome is a constellation of symptoms seen in postmenopausal women. Menopause is defined retrospectively as the permanent cessation of menstruation. It is a retrospective diagnosis when the menses has ceased for 12 months. The significant symptoms that encompass the postmenopausal syndrome are vasomotor (hot flashes), vaginal, insomnia, and mood. Hot flashes are a sudden sensation of heat centered on the upper chest and face that rapidly becomes generalized and lasts two to four minutes with associated perspiration. Palpitations, chills, shivering, and a feeling of anxiety may also be present. This frequency of symptoms ranges from one or two each day to several times per day. It is also reported most commonly at night. This typically lasts for a few years post-menopause but can also persist as long as 20 years.
- Nonhormonal pharmacologic therapies used are selective serotonin reuptake inhibitors (SSRI), serotonin and norepinephrine reuptake inhibitors (SNRI), clonidine patch, and gabapentinoids.
- These are shown to decrease the severity and frequency of hot flashes and response is seen in 2-3 weeks. Escitalopram, paroxetine ER and venlafaxine XR were the most effective.
- SSRIs should be avoided in patients on tamoxifen as it decreases its efficacy. Venlafaxine and desvenlafaxine is the treatment preferred for them.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Postmenopausal Syndrome

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## Question 695:

A 57-year-old woman is scheduled to undergo urgent internal fixation of a fractured humerus. She is known to have primary hyperparathyroidism. Preoperative blood results and the EKG are unremarkable, except for a serum calcium level of 13.2 mg/dL. Which of the following is the best initial therapy for this patient?

## Choices:

1. Intravenous saline and furosemide
2. Intravenous calcitonin
3. Intravenous methylprednisolone
4. Intravenous alendronate

## Answer: 1 - Intravenous saline and furosemide

## Explanations:

- The initial step in the treatment of hypercalcemia is hydration with saline; this helps to decrease the calcium level by dilution. The expansion of extracellular volume also increases renal calcium clearance. Loop diuretics may be used in conjunction with intravenous hydration to increase calcium excretion. This may also prevent volume overload during the therapy.
- Hypercalcemia most commonly occurs due to either malignancy or primary hyperparathyroidism. The normal range of serum calcium levels is 8.5 - 10.5 mg/dL.
- Approximately 40% of calcium is bound to albumin, 50% is ionized and is in the physiologically active form, and the remaining 10% forms complexes with anions. Plasma calcium is regulated by parathyroid hormone (PTH), vitamin D, and calcitonin.
- Intravenous bisphosphates and calcitonin should be considered for the management of symptomatic hypercalcemia. Corticosteroids tend to be more effective in patients with hypercalcemia due to myeloma, sarcoidosis, and vitamin D excess.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hypercalcemia

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## Question 696:

A 17-year-old pregnant woman comes in complaining of palpitations and anxiety for 10 days. She has also been noticing excessive sweating, tremors, and weight loss. She is in her second trimester. Her current medications include iron and folic acid supplementation. Vital signs include blood pressure 135/81 mmHg, pulse 100/minute, respiratory rate 15/minute, and temperature 37.0 C (98.6 F). Laboratory tests include free T3 200 ng/dL, T4 16 mcg/dL, and TSH 0.3 mIU/mL. Physical examination reveals a palpable neck swelling that moves with swallowing. Ultrasonography shows a diffusely enlarged thyroid gland. Which of the following is contraindicated in the management of this patient?

## Choices:

1. Propylthiouracil
2. Radioactive iodine therapy
3. Surgical resection of the thyroid gland
4. Propranolol

## Answer: 2 - Radioactive iodine therapy

## Explanations:

- The symptoms this patient presents with and her elevated serum thyroid levels, low TSH levels, and enlarged thyroid gland point towards a diffuse, toxic goiter, most likely to be Graves disease. Radioactive iodine therapy (RAI) is one of the treatment options for this. But pregnancy is an absolute contraindication.
- Anti-thyroid drugs, including propylthiouracil, can be used in patients with diffuse, toxic goiters, even during pregnancy. But thiamazole is to be avoided in pregnant patients, especially during the second semester.
- Surgery is usually the last line of treatment and is reserved for patients who cannot tolerate antithyroid drugs, RAI, or have compressive symptoms.
- This patient is already in a hyperthyroid state and does not require thyroxine supplementation. However, patients who undergo RAI or surgical ablation end up being hypothyroid and require lifelong thyroid hormone supplementation.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Diffuse Toxic Goiter

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## Question 697:

A 65-year-old male presents to the clinic with complaints of recent weight gain, polyuria, polydipsia, and generalized fatigue. He was told several years ago to lose weight, but he did not bother with any exercise. He has a history of hypertension, gout, arthritis, and smoking. Blood work reveals that he has an HbA1c of 9.4 %, a BUN of 55 mg/dL, a creatinine of 3.4 mg/dL, and elevated lipids. The patient is being referred to several specialists, including the nephrologist. Based on current data, what percentage of patients with this disorder develop nephropathy?

## Choices:

1. Less than 5%
2. 15-20%
3. 50%
4. All patients with diabetes mellitus

## Answer: 2 - 15-20%

## Explanations:

- Today, recent data suggest that about 20% of people with diabetes develop nephropathy.
- About 3% of patients with new-onset diabetes will have evidence of nephropathy, but these individuals also tend to have hypertension and other associated disorders at the same time.
- The development of diabetic nephropathy is very low in normoalbuminuric patients. Patients with no proteinuria have a very low risk of developing the complication.
- The severity of diabetic nephropathy is the greatest in African Americans, followed by Hispanics.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Diabetic Nephropathy

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## Question 698:

A 4-year-old girl was being investigated for failure to thrive. Brain MRI revealed a large solid/cystic suprasellar mass, splaying the optic chiasm and measuring 3 cm × 1.9 cm × 2.3 cm. Preoperative laboratory investigation showed normal morning cortisol, free T4, and prolactin level. The patient underwent trans-sphenoidal near-total resection of the lesion, which was encased within a tumor capsule. Postoperatively, the patient developed transient diabetes insipidus but otherwise recovered well. Three months later, the parents brought the patient to the clinic for excessive sleeping, decrease appetite, and constipation. On examination, the patient had cold skin, a puffy face, and a low heart rate. What is the next best test to confirm her diagnosis?

## Choices:

1. Morning cortisol level
2. Serum TSH
3. Free T4 levels
4. Serum prolactin

## Answer: 3 - Free T4 levels

## Explanations:

- The thyroid function test should be monitored postoperatively as 29-85% of patients can develop hypothyroidism following surgery or radiation treatment.
- Free T4 is the key to diagnosing central hypothyroidism.
- Adrenocortical hormone deficiency symptoms may be subtle, but weight loss, fatigue, dizziness, anorexia, and hypoglycemia may be the initial presenting complaints.
- TSH levels will be inappropriately normal in response to the low free T4 levels.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Pediatric Craniopharyngioma

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## Question 699:

A 19-year old female presents for a regular visit to primary care. She states that she does not have any other medical conditions, nor does she take any medications. However, she complains of feeling sad and significant weight gain despite a decreased appetite for the last six months. When evaluated further, she states that her skin has become dry, and she is losing more hair than usual which she thought was associated with stress due to her freshman year in college. She adds that she has to wear a sweater to college because she feels the classrooms are too cold. Which of the following physical exam finding would be expected in this patient?

## Choices:

1. Hyperreflexia
2. Exophthalmos
3. Non-pitting swelling of the subcutaneous tissues
4. Hepatomegaly

## Answer: 3 - Non-pitting swelling of the subcutaneous tissues

## Explanations:

- This is a classic presentation for hypothyroidism with multiple symptoms of hypothyroidism noted. However, generally, patients do not necessarily have all the symptoms.
- Thinning hair, dry skin, a hoarse and deep voice, bradycardia, myxedema, and a prolonged relaxation in the reflexes all can be seen with hypothyroidism.
- Some patients may have macroglossia, dull facial expression, and periorbital puffiness.
- Hypothermia is a very rare feature of severe hypothyroidism and usually presents in myxedema coma.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hypothyroidism

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## Question 700:

A 40-year-old man is admitted to the hospital with a right tibial fracture after a trivial fall. He was diagnosed with schizophrenia at the age of 17 years. He has used multiple antipsychotic medications in the past, including olanzapine, risperidone, and quetiapine. Since he was non-adherent with his medication and treatment follows up visit, he is being maintained on monthly injectable antipsychotics. He has been using 234 mg paliperidone palmitate monthly injections for the last 3 years. His BMI is 45 kg/m$^2$. An initial set of investigations is shown below.

| | Patient value | Reference range |
|---|---|---|
| HbA1c | 6.9% | 4-6% |
| Serum calcium | 9.8 mg/dL | 8.5-10.2 mg/dL |
| Prolactin | 500 ng/mL | 14 ng/mL |
| 25-hydroxyvitamin D | 8 ng/mL | 25-80 ng/mL |

Dual-energy x-ray absorptiometry of the lumbar spine has a T-score of -2.7 SD. Which of the following is the most likely direct cause of his bone changes**?**

## Choices:

1. Normal aging
2. Obesity
3. Schizophrenia
4. Hyperprolactinemia

## Answer: 4 - Hyperprolactinemia

## Explanations:

- Exposure to multiple antipsychotics, including the high dose injectables, put this patient at an extra higher risk of impaired bone mineral density through various mechanisms like high prolactin level and direct osteoblast inhibition by APs.
- DEXA is still the primary tool for assessing bone density. It has low radiation exposure, precise results, and lower cost.
- Reduction of more than 2.5 SD is clear evidence of osteoporosis.
- Obesity (high BMI) is not a direct risk factor for secondary osteomalacia/osteoporosis. Early schizophrenia or psychiatric condition might not lead to clear bone changes or fracture, but chronic exposure to neuroleptics/antipsychotics is a risk factor for similar changes.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Atypical Antipsychotic Effect On Bone Mineral Density

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## Section 8

Question 701: A 65-year-old man with a past medical history of type 2 diabetes mellitus and uncontrolled hypertension presents with intermittent flushing, palpitations, and chest pain for the last 2 weeks. His blood pressure is 150/90 mmHg, heart rate is 100 beats/min, respiratory rate is 15 breaths/min, and the temperature is 98.6 F (37 C). His electrocardiogram reveals a normal sinus rhythm, whereas his transthoracic echocardiogram and cardiac MRI shows a cardiac mass measuring 7 cm. Abdominal imaging does not reveal any abnormalities. What is the most common site of this mass?

## Choices:

1. In the left atrium
2. In the left ventricle
3. Posterior mediastinum
4. Interatrial groove

## Answer: 4 - Interatrial groove

## Explanations:

- This patient has cardiac pheochromocytoma. Cardiac pheochromocytomas are most commonly located in the interatrial groove, atrioventricular groove, and the root of the great vessels of the heart (including the aorta, vena cava, pulmonary artery, and pulmonary vein.
- Cardiac pheochromocytomas are not usually found in the ventricular or atrial cavities.
- Cardiac pheochromocytomas are rarely malignant.
- Unlike adrenal pheochromocytomas, cardiac pheochromocytomas are sometimes difficult to shell out when resecting.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Cardiac Chromaffin Cell Pheochromocytoma

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## Question 702:

A 30-year-old baseball player is noticed to have excessive redness in his eyes. He also had a similar kind of redness in the past. That time he had a burning sensation, watering from the eyes. It took a few days to treat that problem. This time he only has reddening of eyes. No burning, no discharge, no visual problem. He has a match in a week, so he comes to the clinic for better management of this condition. After proper examination and routine check-up, it is found that he has excessive redness in the face and palm. He has excessively bulky muscles. Blood study shows increased red blood cell count, normal platelet, and white blood count. The clinician suspects that using an agent may be associated with this condition. This agent is contraindicated in which of the following condition?

## Choices:

1. Cryptorchidism
2. Prostate cancer
3. Hypogonadism
4. Testicular torsion

## Answer: 2 - Prostate cancer

## Explanations:

- Athletes may use synthetic testosterone to increase muscle bulk.
- Synthetic testosterone can cause polycythemia (an increase in red blood cell mass). It will present as a facial plethora, conjunctival redness.
- It can be used in hypogonadotropic hypogonadism.
- This agent is contraindicated in prostate cancer because prostate cancer is stimulated by testosterone.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Anabolic Steroids

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## Question 703:

A 55-year-old woman presents with complaints of anorexia, abdominal pain, and lethargy. Her vital signs show a heart rate of 87 beats per minute, blood pressure of 80/50 mm Hg, respiratory rate of 12 breaths per minute, and a temperature of 98.6°Farhenheit. The physical exam is within normal limits. Her labs reveal a serum sodium level of 120 mmol/l, potassium of 6.1 mmol/l, and blood sugar of 51 mg/dl. A preliminary diagnosis of adrenal insufficiency is made. An MRI of the brain and adrenals reveal a nonfunctioning pituitary adenoma and adrenal hypoplasia. What is the hallmark of adrenal hypoplasia?

## Choices:

1. Hyperpigmentation
2. Chronic infections
3. Adrenal insufficiency
4. Intellectual disability

## Answer: 3 - Adrenal insufficiency

## Explanations:

- The hallmark of adrenal hypoplasia is adrenal insufficiency. Patients often present in infancy or childhood. Adult-onset cases are also reported.
- Adrenal insufficiency presents with hypotension and hypovolaemia. Nonspecific symptoms, such as anorexia, nausea, vomiting, abdominal pain, fatigue, lethargy, fever, or altered consciousness, are present. Labs show hyponatremia, hyperkalemia, and hypoglycemia.
- The secondary form of adrenal hypoplasia is caused by pituitary or hypothalamic dysfunction, such as diseases of pituitary development, tumors, isolated Adrenocorticotropic hormone (ACTH) deficiency, and chronic exogenous glucocorticoid treatment.
- These dysfunctions result in deficient ACTH synthesis, which results in adrenal hypofunction and hypotrophy due to a lack of adrenal stimulus.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Adrenal Hypoplasia

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## Question 704:

A 16-year-old female presents to a clinician for a consult. She was diagnosed with a calcium disorder at a young age but cannot provide any specific details about her condition. Her physical exam is remarkable for short fourth and fifth metatarsals, short stature, and seemingly low intelligence level. Currently, she takes calcium and vitamin D supplements but no other medications. She feels well and has no complaints. The patient is unaware of anyone else in the family who has similar problems. She has never had surgery before, and she does not smoke or drink alcohol. Which of the following laboratory abnormalities would you expect to find in this patient?

## Choices:

1. Hypocalcemia, hyperphosphatemia, increased parathyroid hormone (PTH), and decreased urinary cAMP
2. Hypercalcemia, hyperphosphatemia, increased PTH, and decreased urinary cAMP
3. Hypocalcemia, hypophosphatemia, increased PTH, and decreased urinary cAMP
4. Hypocalcemia, hyperphosphatemia, decreased PTH, and increased urinary cAMP

## Answer: 1 - Hypocalcemia, hyperphosphatemia, increased parathyroid hormone (PTH), and decreased urinary cAMP

## Explanations:

- Pseudohypoparathyroidism results from an end-organ resistance to the actions of parathyroid hormone (PTH).
- In pseudohypoparathyroidism, PTH levels will be appropriately increased in response to low calcium levels in the blood, but the body does not recognize the effects of PTH resulting in high levels of phosphate and low calcium levels.
- Pseudohypoparathyroidism is a result of abnormal genetics with three different main variants. Type Ia, also known as Albright hereditary osteodystrophy, is inherited in an autosomal dominant manner and characterized by short stature, round face and short bones of the hands. Type Ib shows resistance to PTH only in the kidneys and does not have the same presentation as type Ia. Type II also shows high blood phosphate levels and hypocalcemia but does not have the same physical phenotype as the other 1a, and its inheritance pattern is unknown.
- The problem in the kidney's response to PTH is the basis of pseudohypoparathyroidism. The resistance to PTH appears to take place in the proximal tubule, leaving the actions of PTH in the thick ascending tubule unaffected. Treatment for pseudohypoparathyroidism is the administration of oral calcium and vitamin D.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Pseudohypoparathyroidism

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## Question 705:

A 17-year-old female patient presents with fatigue, salt craving, and abdominal pain. Her past medical history is unremarkable. Her heart rate is 94 bpm, and her blood pressure is 94/62 mmHg. She denies taking any medications. A physical exam is unremarkable. Labs reveal serum sodium 136 mmol/L, potassium 2.4 mmol/L, chloride 100 mmol/L, bicarbonate 28 mmol/L, BUN 20 mg/dL and creatinine 1.0 mg/dL. Urine studies are remarkable for hypocalciuria. What is the cause of hypomagnesemia in this patient?

## Choices:

1. Increased urinary excretion of magnesium
2. Reduced gastrointestinal absorption of magnesium
3. Combined intestinal and urinary magnesium wasting
4. Hypokalemia

## Answer: 3 - Combined intestinal and urinary magnesium wasting

## Explanations:

- The final plasma magnesium concentration is mainly determined by the balance between the intestinal absorption and renal excretion of magnesium. Both intestinal absorption and renal excretion are regulated by TRMP6 channel expression in the duodenum and distal tubule. In Gitelman syndrome, there is a reduced expression of TRPM6 magnesium channels both in the duodenum and distal tubule resulting in intestinal and urinary magnesium wasting.
- The TRPM6 magnesium channels are localized not only at the apical domain of the distal convoluted tubule but also at the brush border of duodenal magnesium transporter cells. In Gitelman syndrome, there is a downregulation of these at both sites.
- The reduced expression of TRPM6 magnesium channels both in the duodenum and distal tubule results in intestinal and urinary magnesium wasting.
- Hypokalemia is a consequence of hypomagnesemia, and potassium depletion can not be corrected until the correction of magnesium deficiency restores the apical potassium channel function.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Gitelman Syndrome

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## Question 706:

A 78-year-old woman with a known history of restrictive lung disease, congestive heart failure, and hypothyroidism treated with oral levothyroxine, presents to the clinic for a routine medical visit. The patient complains of dyspnea, and after a thorough examination, a chest X-ray, and a CT scan, is diagnosed with thyroid goiter expanding into the substernal space. What is the most appropriate management strategy for this patient?

## Choices:

1. Radioiodine ablation
2. Increase in levothyroxine dose
3. Combination of cervical and thoracic thyroidectomy
4. Sternotomy and thyroidectomy

## Answer: 1 - Radioiodine ablation

## Explanations:

- Radioiodine treatment can be considered in aged patients who are at high risk of a surgical procedure.
- Radioiodine treatment reduces thyroid goiter volume approximately by 40% during the first year in both cervical and substernal goiters.
- It is possible that radioiodine ablation could cause an acute worsening of the tracheal compression or non-diagnosed thyroid cancer.
- Recombinant human TSH (rhTSH) can be added to the treatment protocol with radioiodine, which is considered to lead to greater thyroid tissue reduction.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Substernal Thyroidectomy

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## Question 707: A 57-year-old man with a history of diabetes mellitus and migraine disorder presents to the clinic for a regular follow-up visit. He is currently asymptomatic but his latest lab reports show an increase in serum triglyceride levels. The patient is currently on glimepiride, insulin, acetaminophen, and atorvastatin. Which of the following is the most appropriate drug to be added to his regimen while causing the least adverse effects?

## Choices:

1. Gemfibrozil
2. Niacin
3. Fish liver oil
4. Fenofibrate

## Answer: 4 - Fenofibrate

## Explanations:

- Atorvastatin and fibrates have proven to have the greatest improvement in serum triglyceride levels with the least adverse effects.
- Bezafibrate and fenofibrate are safe to use with statins as it is free of the myopathy adverse effect.
- Gemfibrozil is prone to causing myopathy when combined with statins as it delays the metabolism of the latter.
- Fibrates are much more efficacious than niacin and fish liver oil to improve serum triglyceride levels.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Fibrate Medications

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## Question 708:

A 57-year-old woman presents to the clinic with recurrent episodes of hypoglycemia. She underwent a Roux-en-Y gastric bypass procedure 6 months ago for the management of obesity. The patient describes episodes of sweating, dizziness, blurred vision, and tremors after meals. Blood glucose during one of these episodes was 50 mg/dL. The serum sulfonylurea screen is negative, and insulin antibodies are negative. 9 AM cortisol is 18 mcg/dL (reference range: 5-25 mcg/dL). Which of the following is the next best step in the evaluation of this patient?

## Choices:

1. Mixed meal test
2. CT Abdomen
3. 72 hour supervised fast
4. Short ACTH stimulation test

## Answer: 1 - Mixed meal test

## Explanations:

- The patient's history is suggestive of post gastric bypass hypoglycemia. A mixed meal test is the investigation of choice and should be undertaken first.
- Imaging should be undertaken once the biochemical diagnosis is confirmed with either a mixed meal test or 72 hours supervised fast.
- If a mixed meal test is negative, then 72 hours supervised fast should be considered.
- Cortisol deficiency should be ruled out in all cases of unexplained hypoglycemia. In this patient, a short ACTH stimulation test is not needed. This is because 9 AM cortisol is normal and is at a level that is needed for 30 minutes.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Non-diabetic Hypoglycemia

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## Question 709:

A 57-year-old white female presents with a change in mental status. The family reports that she has been sick for the last 3 to 4 months and has been getting worse. Symptoms included fatigue and tiredness. Her head CT in an emergency department is normal. EKG shows bradycardia with low voltage and chest x-ray shows cardiomegaly. Her thyroid stimulating hormone is 150 mIU/L. What cardiac change can be expected to be present?

## Choices:

1. Increased contractility
2. Tachycardia
3. Decreased stroke volume
4. Hypertension

## Answer: 3 - Decreased stroke volume

## Explanations:

- Her symptoms and the thyroid stimulating hormone (TSH) of greater than 100 mIU/L indicate her diagnosis is myxedema coma. In cardiac tissues, myxedema coma manifests as decreased contractility with subsequent reduction in stroke volume and overall cardiac output. Bradycardia and hypotension are typically present.
- Pericardial effusions may occur due to the accumulation of mucopolysaccharides in the pericardial sac. This leads to worsened cardiac function and congestive heart failure from diastolic dysfunction.
- Capillary permeability is increased throughout the body leading to worsened peripheral edema.
- Electrocardiogram findings may include bradycardia and low-voltage, non-specific ST waveform changes with possible inverted T waves.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Case Study: 60-Year-Old Female Presenting With Shortness of Breath

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## Question 710:

A 46-year-old female has several nodules palpated in the left lobe of the thyroid gland. There is no lymphadenopathy and on pathologic analysis, each nodule shows papillary structures with small, scattered, laminated, round calcifications. Select the other finding most likely seen in the tumors.

## Choices:

1. Normal appearing follicles with fibrous capsule showing focal invasion
2. Clear nuclei having longitudinal nuclear grooves
3. Small round cells in sheets having cytoplasmic glycogen
4. Anaplastic and giant cells

## Answer: 2 - Clear nuclei having longitudinal nuclear grooves

## Explanations:

- The patient has papillary carcinoma as evidenced by papillary structure, laminated calcifications, and clear grooved nuclei.
- Follicular carcinoma shows microfollicles with vascular and capsular invasion.
- Medullary carcinoma has an amyloid stroma.
- Papillary thyroid carcinoma has the best prognosis of the thyroid cancers with up to 80% of patients surviving 10 years or more.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Papillary Thyroid Carcinoma

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## Question 711:

A 45-year-old patient, who is a nurse practitioner by profession, presents to the clinic for a follow-up. Currently, he has no complaints, but his sugar levels have been persistently elevated for the last two months. He was diagnosed with type 2 diabetes mellitus five years back and is currently on glipizide. He is compliant with his medications and practices a healthy lifestyle. Three months back on routine employment checkup, his IFN- gamma assay was elevated (with no other complaints) for which treatment was initiated. Since starting this treatment, he has noticed reddish-orange discoloration of his saliva and sweat. Physical examination is normal. Lab investigations reveal fasting glucose of 220 mg/dL and HbA1c of 6.8%. What is the best next step in management?

## Choices:

1. Switch to a long-acting antidiabetic drug
2. Test the patient for secondary causes of hyperglycemia
3. Advise the patient for stringent lifestyle modifications
4. Check plasma glipizide levels

## Answer: 4 - Check plasma glipizide levels

## Explanations:

- The patient is likely receiving rifampin for his elevated IFN-gamma assay (which indicates latent tuberculosis if raised with symptoms), which is causing reddish-orange discoloration of his saliva and sweat.
- Rifampin is a potent inducer of many drug-metabolizing enzymes, notably cytochrome P450 (CYP) 3A4, and can cause clinically significant drug interactions resulting in decreased efficacy of concomitantly administered drugs. Commonly involved drugs include HIV protease inhibitors, antimycotics (itraconazole and ketoconazole), cyclosporine (can cause graft rejections), calcium channel blockers, sulfonylureas (glipizide), and warfarin. Hence, serum drug concentration levels of concomitantly administered medications should be monitored.
- Rifampin is also known to cause significant hepatotoxicity; therefore, liver functions should also be monitored regularly in patients with existing liver disease and when symptoms/signs of liver damage (anorexia, nausea, right upper quadrant pain, fatigue, jaundice) appear.
- Rifampin is commonly used for the treatment of active/latent tuberculosis (TB), leprosy, and severe gram-positive bacterial infections like osteomyelitis, endocarditis, brain abscess, meningitis, and implant infections in combinations with other antimicrobial agents. Prophylactically, it is used for the prevention of TB and Meningococcal infections in high-risk groups. It is also beneficial as a second-line agent for the treatment of cholestatic pruritis

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## Research Concepts:

### Rifampin

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## Question 712: A 65-year-old male with non-small cell lung cancer undergoes a lobectomy. Postoperatively, he becomes hypotensive, hypothermic, and unresponsive to the usual pressor drugs. Which of the following is best for the immediate treatment of this patient?

## Choices:

1. 500 ml of 5% albumin
2. 100 mg hydrocortisone intravenously
3. 2 grams of magnesium sulfate
4. Intra-aortic balloon pump

## Answer: 2 - 100 mg hydrocortisone intravenously

## Explanations:

- In a patient with non-small cell lung cancer, adrenal insufficiency should be considered.
- These lung cancers can secrete endocrine hormones, and patients may present with adrenal insufficiency when the tumor is removed.
- Adrenal insufficiency should be immediately treated with steroids. Dexamethasone is an alternative initial choice for the management of these patients.
- In a patient who is hypotensive, hypothermic, febrile, and unresponsive to pressor agents, adrenal insufficiency should be suspected.

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## Research Concepts:

### Adrenal Insufficiency

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## Question 713:

A 25-year-old woman presents to the clinic for follow-up. She has a past medical history of primary biliary cirrhosis. She has a history of a cholesterol abnormality. Her lipid panel is shown below.

| | Patient results | Reference range |
|---|---|---|
| Total cholesterol | 1000 mg/dL | 200 mg/dL |
| LDL cholesterol | 420 mg/dL | 100 mg/dL |
| HDL cholesterol | 25 mg/dL | 45-90 mg/dL |
| Triglycerides | 250 mg/dL | 70-150 mg/dL |

Which of the following types of protein is most likely absent in the lipoprotein most likely responsible for this patient's lipid abnormalities?

## Choices:

1. Apo B48
2. Apo-B100
3. Apo C
4. Apo E

## Answer: 2 - Apo-B100

## Explanations:

- Apo-B100 is absent in lipoprotein X, which causes severe hyperlipidemia in patients with liver dysfunction.
- Apo-B100 is a large protein that is present in other lipoproteins like VLDL, LDL, IDL, HDL.
- Apo-B100 causes atherogenicity.
- Lack of Apo-B100 does not cause atherogenicity in patients with lipoprotein X-induced hyperlipidemia.

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## Research Concepts:

### Lipoprotein X Induced Hyperlipidemia

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## Question 714:

A 71-year-old male presents to the hospital with complaints of generalized headaches, weakness, and fatigue for a few weeks. He also complains of feeling thirsty more than normal. He has been diagnosed with hypertension two months ago and is on hydrochlorothiazide and atenolol. His vital signs show blood pressure is 180/100 mmHg, heart rate 80/min, and respiratory rate 16/min. A physical examination was carried out with no significant finding. Laboratory investigations show serum sodium 140 mEq/L, potassium 3.0 mEq/L, chloride 108 mEq/L, blood urea nitrogen 20 mg/dL, and creatinine 1.1 mg/dL. What is the best initial test in order to reach a diagnosis in this patient?

## Choices:

1. Urinary potassium level
2. Serum aldosterone to renin ratio
3. Venous blood sample draining the adrenal wall
4. Serum blood glucose level

## Answer: 2 - Serum aldosterone to renin ratio

## Explanations:

- The patient has evidence of autonomous aldosterone overproduction or Conn syndrome.
- Hypokalemia, hypertension, and low renin levels are characteristics of this syndrome.
- Renal artery fibromuscular dysplasia would result in high renin levels but might require invasive sampling.
- Essential hypertension should have normal potassium.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Conn Syndrome

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## Question 715: Xerosis is a common condition that has been associated with many pathologies. Which one of the endocrine pathologies can present with xerosis?

## Choices:

1. Graves disease
2. Hypothyroidism
3. Type 1 diabetes
4. Gigantism

## Answer: 2 - Hypothyroidism

## Explanations:

- Features of hypothyroidism on the clinical exam include dry skin, pre-orbital puffiness, dry coarse hair, and alopecia. It can be present in up to 60% of patients.
- Others may have bradycardia and non-pitting edema.
- Xerosis has many other causes including aging, improper skin care regimens, and environmental factors.
- The condition is often aggravated by diabetes, Sjogren syndrome, atopic dermatitis, and hypothyroidism.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hypothyroidism

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## Question 716:

A 31-year-old White male presents to the clinic with a 5-year history of inability to conceive with his wife. His wife has had unremarkable testing. He denies any physical complaints other than low libido for the past 6 years. Vital signs are within normal limits, and the patient is 6 foot 1 inch tall and weighs 205 pounds. A genital exam reveals a normal phallus and normal-sized testes with no varicoceles or hydroceles. Detailed evaluation reveals a testosterone level of 560 ng/dL, follicle-stimulating hormone (FSH) level of 12.1 mIU/mL, and luteinizing hormone (LH) level of 5.8 IU/L. A semen analysis reveals a sperm count of 6 million sperm/ml of semen (normal is greater than 15 million sperm/ml of sperm). A karyotype reveals a genotype of 47 ,XYY. Which of the following should the patient be suggested as the best management step in light of this new diagnosis?

## Choices:

1. Continue trying to conceive naturally for another year
2. Consider undergoing in vitro fertilization or intracytoplasmic sperm injection
3. Consider alternate means of fathering a child such as adoption since he will be unlikely to father one himself
4. Consider testosterone supplementation to assist with sperm production

## Answer: 2 - Consider undergoing in vitro fertilization or intracytoplasmic sperm injection

## Explanations:

- 47,XYY men who are being seen for infertility should receive a semen analysis, testicular ultrasound, and bloodwork to measure reproductive hormones. The patient most likely has Jacobs syndrome.
- Men with infertility should receive a comprehensive evaluation from a qualified reproductive endocrinologist.
- Patients who are having difficulty achieving pregnancy due to low sperm counts may need to undergo in-vitro fertilization or intracytoplasmic sperm injection.
- Many men with Jacobs syndrome are fertile despite the increased risk of sperm abnormalities.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Jacobs Syndrome

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## Question 717:

A 29-year-old female presents to the clinic with a 5-month history of amenorrhea, galactorrhea, decreased libido, headaches, and decreased visual acuity. The patient has a history of schizoaffective disorder and hypothyroidism. She currently takes levothyroxine, sertraline, and olanzapine. Her blood pressure is 118/80 mmHg, pulse 80/min, respirations 16/min, and temperature 98.0 F (36.7 C). On physical examination, galactorrhea and decreased axillary and pubic hair is present. Visual examination demonstrates bitemporal hemianopsia. Laboratory results show thyroid-stimulating hormone 3.4 IU/mL, beta-hCG undetectable, and prolactin 575 ng/mL. Which of the following is the best indicator of the most likely diagnosis?

## Choices:

1. Bitemporal hemianopsia
2. History of hypothyroidism
3. Treatment with antipsychotic
4. Treatment with SSRI

## Answer: 2 - History of hypothyroidism

## Explanations:

- This patient has symptoms of hyperprolactinemia, including amenorrhea, galactorrhea, decreased libido, and decreased axillary and pubic hair. However, her history of headaches decreased visual acuity, and bitemporal hemianopsia indicates the mass effect of a tumor and suggest a prolactinoma as the cause of her hyperprolactinemia.
- Signs and symptoms due to mass effect include headaches, vision changes-visual field deficits, blurred vision, decreased visual acuity, cranial nerve palsies-especially with invasive tumors or with pituitary apoplexy, seizures, hydrocephalus, unilateral exophthalmos, and pituitary apoplexy.
- Physiological causes of hyperprolactinemia are pregnancy, nipple stimulation in lactating women, and stress.
- Pathological causes of hyperprolactinemia include hypothalamic disorders, craniopharyngiomas, meningioma, dysgerminoma, non-secreting pituitary adenomas, sarcoidosis, histiocytosis, cranial irradiation, pituitary disorders, prolactinoma, acromegaly/Cushing disease, empty sella syndrome, lymphocytic hypophysitis, drugs (dopamine antagonists), antipsychotics, tricyclic antidepressants, SSRIs, metoclopramide, domperidone, prochlorperazine, verapamil, alpha-methyldopa, morphine, methadone, hypothyroidism, and idiopathic hyperprolactinemia.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Prolactinoma

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## Question 718:

A 55-year-old obese female presents for a routine health visit. The patient has a past medical history of hypertension, hepatitis, hyperlipidemia, type 2 diabetes mellitus, and chronic kidney disease. Her current list of medications includes amlodipine, atorvastatin, lisinopril and metformin. The patient has tried to control her blood sugar with diet and exercise and has been unsuccessful. The patient's recent hemoglobin A1c (HbA1c) is reported 8.2%. Her most recent estimated glomerular filtration rate (eGFR) was 35. The clinician decides to add a medication for her uncontrolled glucose that also has beneficial effects on her cardiovascular and renal disease. What might be a contraindication to the most likely class of medication being considered?

## Choices:

1. Congestive heart failure
2. Dialysis
3. Impaired liver function
4. Immunosuppression

## Answer: 2 - Dialysis

## Explanations:

- This patient was initiated on a sodium-glucose co-transporter-2 (SGLT-2) inhibitor. SGLT-2 inhibitors are antihyperglycemic agents that act on the SGLT-2 enzymes expressed in the renal proximal tubules and promote urinary glucose excretion.
- All four SGLT-2 inhibitors (canagliflozin, dapagliflozin, empagliflozin, and ertugliflozin) are contraindicated in patients receiving treatment with dialysis.
- Hypersensitivity reactions such as anaphylaxis or angioedema to any of the four agents are also an absolute contraindication. Laboratory monitoring of complete blood count (CBC), basic metabolic panel (BMP), lipid panel, and kidney function tests should be performed routinely as changes in serum creatinine, eGFR, hematocrit, hemoglobin, low-Density lipoprotein (LDL) cholesterol, serum bicarbonate, serum phosphate, and potassium may occur.
- Congestive heart failure is not a contraindication but an indication of dapagliflozin. Empagliflozin and dapagliflozin may be used in patient with impaired liver function and immunosuppression is not a contraindication to any of the four SGLT-2 inhibitors.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Sodium-Glucose Transport Protein 2 (SGLT2) Inhibitors

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## Question 719: A 34-year-old female patient presents to the office for evaluation. A small nodule in the anterior left neck, measuring approximately 1 cm on palpation, was noticed. Which of the following test is the most appropriate next step?

## Choices:

1. Measurement of TSH
2. CT scanning
3. Fine-needle aspiration biopsy
4. Ultrasonography

## Answer: 1 - Measurement of TSH

## Explanations:

- This patient has a left thyroid nodule.
- Measuring thyroid-stimulating hormone (TSH) should be the initial test and be used as a guide for further management for all patients presenting with thyroid nodules.
- All the other choices provide additional information about the physical or physiologic characteristics of the nodule, but TSH should be the guide for initial management.
- It helps monitor patients in the postoperative period who have undergone surgical resection for well-differentiated thyroid cancer.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Thyroid Nodule

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## Question 720:

A 15-year-old male presents to the emergency department with generalized weakness, asthenia, fatigue, weight loss, anorexia, and progressive hyperpigmentation of skin for six months. Past medical history is significant for achalasia. Medication includes the use of artificial tears since the age of 8 years. Examination reveals a lean build patient (body mass index, 12.64 kg/m2), with hyperpigmentation of tongue, buccal mucosa, and skin and a nasal twang to voice. His blood pressure is 100/60 mm Hg with a postural drop. Neurological examination revealed the wasting of the thenar and hypothenar muscle. Baseline investigations reveal normal complete blood counts, serum creatinine, serum Na 142 mmol/L, and serum K 4.1 mmol/L. Basal serum cortisol (8:00 AM) was very low (0.41 µg/dL) and failed to increase after intravenous injection of 250 µg of adrenocorticotropic hormone (30 minutes and 60 values of 0.47 and 0.45 µg/dL, respectively). The plasma adrenocorticotropic hormone (ACTH) levels were markedly elevated (1,262 pg/mL; normal range, 9 to 52 pg/mL). A contrast-enhanced computed tomography of the abdomen showed prominent adrenal calcification. Adrenal insufficiency is suspected. What is the next best step?

## Choices:

1. Start hydrocortisone
2. Chest X-ray and tuberculin test
3. Start IV fluid and fludricortisone
4. Computed tomography scan head

## Answer: 2 - Chest X-ray and tuberculin test

## Explanations:

- The differential for adrenal calcification includes hemorrhage (blunt abdominal trauma, pseudocyst, sepsis secondary to Waterhouse-Friderichsen syndrome), infections (tuberculosis, histoplasmosis), and adrenal tumors. Given the history of significant low BMI, weight loss, fatigue, an infectious source can be considered.
- The next pertinent step, in this case, includes the tuberculin test and chest X-ray to rule out tuberculosis.
- The patient is hemodynamically stable use of IV fluids, and fludrocortisone is not warranted. Hydrocortisone is the appropriate treatment, but first, it needs to rule out the underlying cause of adrenal insufficiency.
- In the case of endocrinology disorders, imaging is the last step after treatment failure or inconclusive lab test.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Allgrove Syndrome

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## Question 721:

A 65-year-old woman presents to the office as a new patient. She has a past medical history of type 1 diabetes mellitus, hypertension, and celiac disease that she manages with diet. Her current medications include glyburide, lisinopril, and amlodipine. She reports she is compliant with all medications and that her most recent hemoglobin A1c was 8.7% one month ago. She asks if there is another once-daily medication she can take to help her achieve better glycemic control. The clinician decides to prescribe a once-daily medication that will plateau after 1 to 2 hours and mimic a hormone that the body naturally produces. Which of the following best describes this medication?

## Choices:

1. Intermediate-acting insulin that can be interchanged with another insulin type
2. Intermediate-acting insulin that cannot be interchanged with another insulin type
3. Long-acting insulin that can be interchanged with another insulin type
4. Long-acting insulin that cannot be interchanged with another insulin type

## Answer: 3 - Long-acting insulin that can be interchanged with another insulin type

## Explanations:

- Biosimilars are biological agents that are highly analogous to their reference products currently approved and licensed by the U.S. Food and Drug Administration (FDA). Biosimilars possess no differences in their safety, purity, potency, or effectiveness compared to their respective reference biologic agents.
- Insulin glargine-yfgn is the first insulin biosimilar agent to receive FDA approval and is also the first interchangeable agent in the class of biosimilar agents. Interchangeable products are biosimilars that meet additional criteria specified by the Biologics Price Competition and Innovation Act during the assessment and testing of the agent during its FDA approval process.
- Once an interchangeable product has been approved, it may be interchanged for their reference product without requiring additional consultation from the prescribing physician or healthcare professional.
- Insulin glargine-yfgn is classified as a long-acting human insulin analog, making it biosimilar to its reference product insulin glargine, also a long-acting human insulin analog. Like its reference product, insulin glargine-yfgn regulates glucose metabolism by binding to its target tyrosine kinase insulin receptors, causing a conformational transition to the receptors' beta catalytic domains and resulting in autophosphorylation activation of the beta subunits. The beta subunits further stimulate phosphatidylinositol-4,5-bisphosphate 3-kinase (PI3k), initiating kinase B, which controls the action of the glucose transporter type 4 (GLUT4) receptor, protein kinase C (PKC), and mitogen-activated protein kinase (MAPK). The intracellular pathway activation further reduces plasma concentration by inciting peripheral glucose uptake by cells in the skeletal muscle and adipose tissue and diminishing glucose production in the liver. It also represses lipolysis and proteolysis and increases protein synthesis. Insulin glargine-yfgn, similar to its reference agent, is indicated in the treatment of type 1 diabetes mellitus.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Biosimilars Use In Medicine For Inflammatory Diseases

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## Question 722:

A 24-year-old female comes in the clinic with complaints of weight loss and anorexia. She was recently treated for oral thrush and monilial vaginitis. Past medical history is insignificant. Vital signs show pulse rate 76/min, blood pressure 105/65 mmHg, respiratory rate 15/min, and temperature 98.6 F (37 C). The exam shows hyperpigmentation on the oral mucosa. Laboratories show hemoglobin 13.0 g/dL, hematocrit 38%, white blood cell count 4500/microL, platelets 250,000/microL sodium 132 mEq/L, potassium 5.4 mEq/L , and creatinine 0.8 mg/dL. HIV testing was negative. What are the other conditions that are associated with this syndrome?

## Choices:

1. Hyperthyroidism
2. Celiac disease
3. Myasthenia gravis
4. Hypoparathyroidism

## Answer: 4 - Hypoparathyroidism

## Explanations:

- Type 1 polyglandular autoimmune syndrome (APS-1) or autoimmune polyendocrinopathy-candidiasis-ectodermal dystrophy (APECED) is characterized by hypoparathyroidism, adrenal failure, and mucocutaneous candidiasis. APS-1 is due to mutations in the autoimmune regulatory gene (AIRE).
- Diagnostic criteria for autoimmune polyglandular syndrome- 1 includes the presence of two of the triad of chronic mucocutaneous candidiasis, hypoparathyroidism, or Addison disease. One of the above triad plus a sibling with proven APS-1 and also known disease-causing mutations in the AIRE gene.
- The patient presents with signs and symptoms of adrenal insufficiency, parathyroid hormone deficiency, or mucocutaneous candidiasis without any other underlying condition.
- The type 2 polyglandular autoimmune syndrome is characterized by type 1 DM, autoimmune thyroid disease, celiac disease, Addison disease, and myasthenia gravis.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Polyglandular Autoimmune Syndrome Type I

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## Question 723:

A 16-year-old male is brought in to the primary care office for a follow-up visit by his mother. He is overweight and does not exercise. The patient is fond of eating fatty foods. His parents consulted a clinician for his weight management but still he had no weight loss. His father was diagnosed to have a cholesterol level of more than 200 mg/dL at the same age. The vital signs show a blood pressure of 120/70 mmHg, temperature 37.5 C (99.5 F), cardiac rate 80/min, and a respiratory rate of 22 breaths/min. He has a BMI of 30. The physical exam shows that his body fat is concentrated in the abdominal area. Laboratory exam reveals a total cholesterol of 200 mg/L, HDL 60 mg/dL, LDL 160 mg/dL, and triglycerides 140 mg/dL. Treatment was started with a bile acid sequestrant. Which of the following is an adverse reaction to the medication that was started?

## Choices:

1. Elevated liver enzymes
2. Prolonged QT interval
3. Increased blood sugar
4. Steatorrhea

## Answer: 4 - Steatorrhea

## Explanations:

- Colesevelam is a bile acid sequestrant that is an FDA approved drug to be used in adjunct with diet and exercise for a variety of indications.
- The main indication is to lower an elevated low-density lipoprotein cholesterol (LDL-C) in patients with primary hyperlipidemia and other diseases that cause hyperlipidemia. It can be used as a monotherapy or with an HMG-CoA reductase inhibitor (statin), ezetimibe or niacin, or in a three- or a four-drug combination. Another approved use is to reduce LDL-C levels in boys and postmenarchal girls ages 10-17 who have heterozygous familial hypercholesterolemia. For this situation, colesevelam can be used as a monotherapy or with a statin only after a proper trial of diet and exercise has failed. Finally, the last FDA approved indication is to improve glycemic control in type 2 diabetic adults.
- Colesevelam is part of the drug class known as bile acid sequestrants. While overall, very effective and safe to use as a nonsystemic approach to lower cholesterol, tolerability, and compliance issues are not uncommon.
- Colesevelam has the lowest rate of side effects associated with its use, but it still shares the same side effects as the rest of the drugs in its class. Due to the mechanism of action and causing increased bile acid in the gastrointestinal tract, the predominant side effects are gastrointestinal. Symptoms like constipation, diarrhea, gas, as well as nausea, abdominal pain, and weakness, are common. Patients have also noted muscle pain to be a side effect of colesevelam. Other notable side effects associated with the use of colesevelam is a significant increase in triglycerides. Also, steatorrhea is a common side effect of these drugs as well.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Colesevelam

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## Question 724:

A 17-year-old female presents to evaluate swallowing difficulty, which has been progressively worsening over the last six months. She also reports hoarseness and multiple episodes of kidney stones. She does not smoke or drink alcohol and takes no medications. There is a family history of thyroid cancer in her father, who underwent thyroidectomy before 30. Her vital signs are within normal limits. Physical examination is unremarkable. Laboratory studies show serum calcium level of 11.6 mg/dL, serum phosphorus level of 2 mg/dL, and calcitonin level of 13 pg/mL (N 8.8). Ultrasonography of the thyroid gland shows hypoechoic thyroid lesions. Which of the following should be considered before attempting surgery on this patient?

## Choices:

1. MRI of the thyroid
2. 24-hour urinary catecholamine determination
3. Urine 5-HIAA levels
4. Chest radiograph

## Answer: 2 - 24-hour urinary catecholamine determination

## Explanations:

- The patient presents with signs of medullary thyroid carcinoma and primary hyperparathyroidism. These signs are suggestive of MEN-2A syndrome. Nearly 40% of the patients with MEN-2A and 50% with MEN-2B develop pheochromocytoma, which is also likely to be bilateral. Before doing the surgery for medullary thyroid carcinoma, it is compulsory to rule out the presence of pheochromocytoma, and if present, it should be removed first.
- The detection of a serum calcitonin level above the high limit of normal is an indication for surgery. General anesthesia in an undiagnosed pheochromocytoma could result in a devastating clinical situation as intraoperative catecholamine release from the tumor could lead to hemodynamic instability during the procedure.
- For the patients with high-risk mutations of MEN-2A, total thyroidectomy with lymph node dissection is indicated.
- Ultrasound-guided fine-needle aspiration (FNA) would be reasonable for a thyroid mass; however, it does not have 100% accuracy in diagnosing medullary thyroid cancer.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Multiple Endocrine Neoplasias Type 2

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## Question 725:

A 16-year-old girl presents to the clinician with a complaint of an enlarging clitoris. She feels very insecure about her condition. On examination, her pulse rate is 80 beats/minute, and blood pressure is 114/70 mmHg. Physical examination reveals the presence of a penis and unfused scrotal sacs. Abdominal examination reveals bilateral palpable masses in the inguinal region. Further investigation shows a karyotype analysis of 46 XY. Which of the following is the site of synthesis of the deficient hormone?

## Choices:

1. Adrenal gland
2. Ovaries
3. Pituitary gland
4. Peripheral target tissues

## Answer: 4 - Peripheral target tissues

## Explanations:

- The patient most likely has 5-alpha-reductase enzyme deficiency leading to insufficient development of the external male genitalia due to decreased DHT.
- These patients are generally raised as girls, but around the time of puberty, an increase in the testosterone levels leads to the development of the external genitalia.
- Peripheral 5-alpha-reductase type 2 converts circulating testosterone to DHT. It is formed primarily in peripheral tissues of the body where it exerts its effects. The hormone is responsible for proper male differentiation of the urogenital sinus, the genital tubercle, urogenital fold, and labio-scrotal folds.
- Patients born with a 5-alpha-reductase deficiency have underdeveloped genitalia, undescended functional testes, and a small prostate.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Biochemistry, Dihydrotestosterone

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## Question 726:

A 50-year-old man presents to the hospital for the management of type 2 diabetes mellitus that was diagnosed six months ago. His most recent HbA1C was 8.2%. He also has a history of high blood pressure, hyperlipidemia, and obstructive sleep apnea. He informs the provider that he has always been overweight since childhood, and diet modification failed to lower weight. His current weight is 125 kgs and has a body mass index (BMI) of 40 kg/m^2. He takes metformin, canagliflozin, aspirin, simvastatin, and amlodipine. The patient is advised to undergo gastric bypass surgery for long term control of his type 2 diabetes. Ten days later, after undergoing preoperative risk assessment, the patient undergoes gastric bypass. During the operation, the patient, while on an insulin drip and D5NS (5% dextrose in normal saline), experiences an increase in glucose level. What is the most appropriate next step?

## Choices:

1. Stop the D5NS and start Ringer lactate
2. Give supplemental insulin
3. Give supplemental insulin IV
4. Give supplemental insulin IV and increase the drip rate

## Answer: 4 - Give supplemental insulin IV and increase the drip rate

## Explanations:

- Bariatric surgery may be indicated in a patient with type 2 diabetes who has a BMI of 35 or above (stage two obesity).
- Intraoperatively, it is important to have dextrose for calories. Insulin should be given IV, and the drip increased to drive glucose intracellularly.
- It is important to administer only regular insulin IV as it works immediately and has a short half-life.
- Frequent measurements of blood glucose are key during the surgery to avoid hypo- or hyperglycemia.

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## Research Concepts:

### Diabetes Intraoperative Management

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## Question 727:

A 67-year-old non-smoker, non-alcoholic male patient visits the office with his wife complaining of dark urine and abdominal pain since a week. His wife has noticed him being more tired than usual for a month. His medical history includes diabetes mellitus type II and hypothyroidism. His current medications include thyroxine, pioglitazone, and metformin. On examination, his vitals and system review are within normal limits, except for a yellow sclera. Lab reports demonstrate deranged liver function tests. If the cause of the patient's symptoms is drug-induced, what is the mechanism of action of the potentially responsible drug being used by the patient?

## Choices:

1. Increase insulin sensitivity
2. Increase insulin secretion
3. Decrease insulin secretion
4. Block insulin receptors

## Answer: 1 - Increase insulin sensitivity

## Explanations:

- The thiazolidinediones e.g. pioglitazone, a class of anti-diabetic medications, used for type II diabetes, acts on PPAR-gamma receptors to increase insulin sensitivity.
- A known side effect of Pioglitazone is to cause deranged liver function tests(LFT). LFTs are performed before, and at follow up every 2 months for the first year and then periodically, after starting therapy.
- Patients should be advised to look for signs like unexplained fatigue, abdominal pain, dark urine, etc and report to their doctor when on this drug.
- Pioglitazone does not promote the release of insulin from the pancreas. Use of pioglitazone results in a lowering of hyperglycemia and hypertriglyceridemia, as well as improvements in HbA1c.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Pioglitazone

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## Question 728:

A 17-year-old male is admitted with nausea, vomiting, lightheadedness, and weight loss for the last six months. On examination, his blood pressure is 80/50 mmHg, and heart rate is 92 bpm. He is euvolemic with no signs of fluid overload. Initial laboratory tests show hyponatremia, normal thyroid-stimulating hormone. His random cortisol is 4 mcg/dl. Which of the following would be the next best step in the management of this patient?

## Choices:

1. 250 mcg cosyntropin stimulation test
2. Water deprivation test
3. MRI brain
4. 1 mcg cosyntropin stimulation test

## Answer: 1 - 250 mcg cosyntropin stimulation test

## Explanations:

- Random serum cortisol less than 9mg/dl should be further evaluated with a cosyntropin stimulation test. The cosyntropin test, also known as the ACTH test, is diagnostic of primary adrenal insufficiency.
- Random cortisol is a good screening test for the evaluation of adrenal insufficiency. Serum cortisol > 9 mg/dl rules out adrenal insufficiency.
- Adrenal insufficiency can present as the insidious onset of nausea, vomiting, weight loss and hypotension. Other causes of hypotension should be ruled out including fluid overload with heart, liver or kidney failure.
- 1 mcg cosyntropin stimulation test (CST) or low dose CST can be considered in the evaluation of secondary or tertiary adrenal insufficiency. It is done similar to high dose CST and utilizes the same cut-offs for diagnosis but utilizes 1 mcg cosyntropin instead of 250 mcg. There are several limitations of low dose CST. 1 mcg CST should not be used in the evaluation of adrenal insufficiency in critically ill patients. There is also technical difficulty in administering 1 mcg dose.

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## Research Concepts:

### Adrenocorticotropic Hormone Test

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## Question 729:

A 65-year-old man with a history of type 2 diabetes mellitus presents to the clinic for a routine check-up. The patient's HbA1c level has dropped from 8% to 6.7% by following dietary guidelines, exercising, and being compliant with his medication (metformin). Ramadan (the month where Muslims fast from sunrise to sunset) is approaching and the patient wants advice as he is Muslim. Which of the following is the most appropriate recommendation for this patient?

## Choices:

1. Do not fast
2. Adjust the patient's dose of metformin
3. Stop metformin for the duration of Ramadan
4. Continue with the same doses

## Answer: 2 - Adjust the patient's dose of metformin

## Explanations:

- In Islam, it permissible for the sick, pregnant, breastfeeding, menstruating, intellectually disabled, travelers, and postpartum mothers to not fast during the month of Ramadan. Despite this, some Muslims may still choose to fast, and clinicians should advise the patients and prepare them for situations where they may need to break the fast.
- The patient in the scenario has well-controlled diabetes and does not have other medical problems, so he can fast. The dosage of his metformin can be changed by giving it twice daily, 1/3 with the pre-dawn meal, and 2/3 after opening the fast.
- For patients on insulin, the units should be decreased to prevent hypoglycemia. It should be noted injecting insulin is not permitted during fasting. Sulfonylureas should also be adjusted to twice daily. Other diabetic drugs that do not cause hypoglycemia need not be adjusted, and can be taken as is.
- The patient should be asked to monitor glucose regularly and should take more carbohydrates and keep hydrated to stay healthy and keep blood sugar in control.

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## Research Concepts:

### Cultural Competence in the Care of Muslim Patients and Their Families

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## Question 730:

A 45-year-old female with a history of hypertension, type 2 diabetes mellitus, chronic kidney disease stage 4, and severe systolic chronic heart failure who recently underwent heart transplantation is evaluated for preventive treatment post-transplantation osteoporosis. The patient's laboratory results show a hemoglobin level of 9.2 g/dl, serum calcium level is 8.9 mg/dl, serum albumin level is 3.3 g/dl, BUN is 45 mg/dl, serum creatinine level is 3.5 mg/dl, and calculated is GFR 26 ml/min. Bone densitometry reveals T-scores of -1.5 at the femoral neck and -1.3 at the lumbar spine. A lumbar spine radiograph shows no compression fractures. A decision is made to initiate preventive therapy with calcitriol 0.5 mcg/ day. Which of the following parameters should be monitored periodically in this patient?

## Choices:

1. Serum 25-hydroxy vitamin D level
2. 1, 25-dihydroxy vitamin D level
3. Serum and urinary calcium levels
4. Serum phosphorus and creatinine levels

## Answer: 3 - Serum and urinary calcium levels

## Explanations:

- Bisphosphonate therapy is not recommended for patients with a calculated GFR of less than 30- 35 ml/min.
- Calcitriol can be used as preventive therapy for patients with no documented osteoporosis in whom bisphosphonates are contraindicated or not recommended, especially in renal transplant recipients.
- Serum and urinary calcium levels should be monitored periodically in patients on calcitriol therapy, and therapy should be discontinued in patients who develop hypercalcemia or hypercalciuria.
- Serial monitoring of levels of plasma 25-hydroxy vitamin D and 1,25-dihydroxy vitamin D is not required to determine safety in patients on calcitriol therapy.

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## Research Concepts:

### Transplantation Osteoporosis

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## Question 731:

A 35-year-old woman presents to the office for a routine check-up. She has no current complaints. She has a history of diabetes mellitus type 2 and hypertension. Her medications include metformin and amlodipine, which she takes regularly. She does not smoke but drinks alcohol socially. She is married and has two children. Vitals show a blood pressure of 135/90 mmHg, a pulse of 75/min, respiratory rate of 12 breaths/min, and temperature of 98.6 F (37 C). Physical examination reveals the darkening of the skin in the neck, axilla, and groin. On palpation, the areas appear thicker than the surrounding skin. Which of the following best describes the pathophysiology of the patient’s condition?

## Choices:

1. Epidermal keratinocyte and dermal fibroblast proliferation
2. Dermal fibroblast proliferation and melanocyte proliferation
3. Abnormal melanocyte proliferation only
4. Epidermal keratinocyte proliferation only

## Answer: 1 - Epidermal keratinocyte and dermal fibroblast proliferation

## Explanations:

- This patient has most likely developed acanthosis nigricans. Acanthosis nigricans is a velvety, darkening of the skin that usually occurs in intertriginous areas.
- This hyperpigmentation has poorly defined borders, usually occurs in skin fold areas, such as the back of the neck, axilla, and groin, and may include thickening of the skin.
- It occurs as a result of epidermal keratinocyte and dermal fibroblast proliferation.
- In older individuals, acanthosis nigricans may be associated with malignancy.

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## Research Concepts:

### Acanthosis Nigricans

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## Question 732:

A 40-year-old man presents to the clinic with a complaint of fatigue, weight loss, and difficulty swallowing for the past two months. He also reports hoarseness in his voice during this time. He has a family history of Graves disease in his mother. He has a two-pack per day smoking history for 15 years. Physical examination shows a thin anxious male with a palpable, non-tender nodule in the front of his neck. A fine-needle aspiration confirms a well-differentiated carcinoma. The patient does not agree to surgical treatment, and treatment with an oral nuclear agent is decided. What is the most likely mechanism of action of this agent?

## Choices:

1. Beta rays causing permanent tissue destruction
2. Gamma rays causing permanent tissue destruction
3. Deiodinase inhibition
4. Thyroid peroxidase inhibition

## Answer: 1 - Beta rays causing permanent tissue destruction

## Explanations:

- This patient with confirmed well-differentiated thyroid carcinoma is prescribed radioactive iodine therapy.
- Radioactive iodine (RAI) exerts its effects once it is taken up by the follicular cells of the thyroid, emitting beta rays that further cause definitive local damage to the thyroid tissue.
- It is classified as radioactive nuclear medicine and was synthesized in 1941, and the FDA approved it in 1971 for its therapeutic use. Its action causes permanent destruction to the thyroid tissue by emitting radiation of two sorts, gamma and beta rays.
- Iodine is a natural precursor for thyroid hormones triiodothyronine (T3) and thyroxine (T4) and is uptaken from the blood into the thyroid follicular cell by the sodium and iodide transporter.

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## Research Concepts:

### Radioactive Iodine Therapy

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## Question 733:

A 2-year-old boy with a history of speech delay is brought to the clinic for further evaluation. He had an audiology test and was found to have a bilateral sensorineural hearing impairment. A thyroid swelling is noticed on examination, while thyroid function tests are within normal limits. Pendred syndrome is suspected. What is the most definitive test to confirm the diagnosis?

## Choices:

1. Thin-cut CT of the temporal bone
2. Repeat thyroid function testing
3. Detailed family history and evaluation
4. Genetic testing

## Answer: 4 - Genetic testing

## Explanations:

- Because of the high variability of phenotype, it is difficult to diagnose Pendred syndrome on the basis of clinical diagnosis, and molecular genetic testing needs to be done to confirm the diagnosis.
- Pendred syndrome usually presents with a euthyroid goiter and sensorineural hearing loss.
- Pendred syndrome has an autosomal recessive inheritance.
- Family history is important, but definitive diagnosis is with molecular genetic testing. Patients with Pendred syndrome have temporal bone abnormalities and vestibular aqueduct enlargement, so imaging is usually done for patients suspected to have Pendred syndrome, but it does not confirm the diagnosis.

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## Research Concepts:

### Pendred Syndrome

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## Question 734:

A 65-year-old male diagnosed with diabetes 2 years ago, presents to the office for a follow-up visit after complete recovery from a syndromic presentation involving asymmetrical, progressive, severe neuropathic pain on the proximal lower extremity, with late contralateral distribution to bilateral lower extremity, accompanying motor-weakness, areflexia, muscle wasting, and 25 pounds (11.3 kg) weight loss. The patient recently underwent a sural nerve biopsy. What histopathological findings would be expected?

## Choices:

1. Metastatic disease
2. Microvasculitis and ischemia
3. Nerve avulsion
4. No abnormal findings on nerve biopsy

## Answer: 2 - Microvasculitis and ischemia

## Explanations:

- Biopsies may demonstrate degenerative changes secondary to microvasculitis, with accompanying ischemia and inflammation.
- A biopsy is rarely indicated in a patient with diabetic amyotrophy, but atypical cases or severe presentations may warrant further diagnostic work-up, and its use may aid in confirming the diagnosis.
- Other diagnostic studies may also be useful in conjunction but have not been addressed in this clinical scenario (markers of inflammation, hemoglobin A1c, CT, MRI, etc.).
- Metastatic disease, trauma, and infection may cause similar presentations, but histopathologic findings may not be evidenced, as seen in diabetic amyotrophy.

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## Research Concepts:

### Diabetic Amyotrophy

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## Question 735:

A 45-year-old male presents to the emergency department with back pain and diarrhea. His symptoms started 20 hours ago, and his pain has now become unbearable. He also has bloating, nausea, and 2 episodes of emesis. He says that he noticed that his stools are floating in the toilet bowl. On examination, there are yellowish plaques on both his eyelids. The patient states that he has had these skin plaques for as long as he can remember. His BMI is 38. The patient states he started a cholesterol-lowering medication a few weeks ago. His laboratory tests show his lipase levels are 900 U/L, and his triglyceride levels are 380 mg/dL. Which of the following medications is most likely to have contributed to his presentation?

## Choices:

1. Colesevelam
2. Niacin
3. Fibrates
4. PCSK9 inhibitors

## Answer: 1 - Colesevelam

## Explanations:

- Bile acid sequestrants should not be used in patients with serum triglycerides greater than 300 mg/dl or have type III hyperlipoproteinemia, as seen in this patient since they can exacerbate hypertriglyceridemia and put the patient at risk for pancreatitis.
- BAS are discontinued if triglycerides are more than 400 mg/dL.
- Bile acid sequestrants are used with caution in patients with triglyceride levels of 250 to 299 mg/dL with regular monitoring every 4-6 weeks after administration.
- Niacin, fibrates, and PCSK9 inhibitors are not contraindicated in patients with elevated triglyceride levels.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Antilipemic Agent Bile Acid Sequestrants

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## Question 736:

A 39-year-old man is brought to the hospital by a colleague at work after he suddenly became sweaty and lost consciousness 25 minutes ago. His blood glucose is 42 mg/dl, and his symptoms significantly improve with a 50% glucose infusion. C-peptide level is 2.5 ng/mL (0.78-1.89). The patient reports that he has had progressive episodes of headache, increased thirst, and bone pain for the past six months. His sister recently underwent parathyroidectomy for multiple parathyroid adenomas identified via imaging after she was found to have symptomatic hypercalcemia. Given the likely diagnosis, what genetic testing would most help confirm the diagnosis in this patient?

## Choices:

1. MEN1 gene
2. HRPT2 gene
3. AIRE gene
4. RET gene

## Answer: 1 - MEN1 gene

## Explanations:

- Insulinomas are rare pancreatic islet cell tumors that occur approximately 1 case per 250,000 person-years. While most are sporadic, some are associated with multiple endocrine neoplasia type 1 (MEN1) syndrome.
- Hyperparathyroidism is present in MEN1 (MEN1 gene), MEN2A (RET proto-oncogene), and hyperparathyroidism-jaw tumor syndrome (HRPT2 gene).
- Histologic examination and immunostaining for chromogranin A, synaptophysin, and insulin should be done to support the diagnosis of insulinoma.
- AIRE gene is present in autoimmune polyendocrine syndrome type I that usually includes hypoparathyroidism, candidiasis, and Addison disease.

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## Research Concepts:

### Insulinoma

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## Question 737: A 28-year-old male presents to an endocrinology clinic for evaluation. He states he has been attempting to lose weight over the past two months with mixed results. The patient states his weight loss started off well but has only lost 1 pound (0.5 Kg) over the past month. He reports he feels very tired and fatigued overall every day and is losing motivation. On his blood tests, which of the following findings would you expect for his condition?

## Choices:

1. Increased leptin, decreased insulin, decreased T3, decreased ghrelin, increased cortisol
2. Decreased leptin, decreased insulin, decreased T3, increased ghrelin, increased cortisol
3. Increased leptin, increased insulin, increased T3, decreased ghrelin, decreased cortisol
4. Decreased leptin, increased insulin, decreased T3, increased ghrelin, decreased cortisol

## Answer: 2 - Decreased leptin, decreased insulin, decreased T3, increased ghrelin, increased cortisol

## Explanations:

- The patient is experiencing a weight loss plateau, which occurs when the body attempts to compensate for energy mismatch by conserving energy expenditure.
- Leptin is a satiety hormone and is decreased when energy levels are at a deficit. Ghrelin works opposite to leptin and is known as a hunger hormone, which is elevated in this state.
- Insulin and T3 are anabolic/anorexigenic and help preserve energy expenditure.
- Cortisol is a catabolic hormone and is upregulated with decreased energy intake.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Management Of Weight Loss Plateau

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## Question 738: A 50-year-old man presents to the clinic with flushing of the face, diarrhea, and 10 lbs weight loss over one month. The clinician is suspecting neuroendocrine tumour. Whole body MRI and CT imaging reveal no lesions. Which of the following is the next best step in the management of this patient?

## Choices:

1. 111Ln-Octreoscan
2. 68-Ga DOTATATE PET-CT
3. Biochemical evaluation
4. 18-FDG PET

## Answer: 2 - 68-Ga DOTATATE PET-CT

## Explanations:

- 68-Gallium DOTATATE PET-CT can detect significantly more lesions in patients with negative anatomical imaging compared with 111-ln-octreoscan (30 vs. 2; p = 0.028).
- 68-Gallium DOTATATE PET-CT scans detect 74.3% of the lesions, whereas 111-ln-octreoscan detect 12% of the lesions.
- 68-Gallium DOTATATE PET-CT is helpful in the detection of NETs in symptomatic patients with no evidence of disease on the basis of anatomical imaging and endoscopic evaluation, with or without biochemical evidence of disease.
- Patients with a difficult diagnosis should be offered 68-Gallium DOTATATE PET-CT.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### PET Scanning

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## Question 739:

A 65-year-old female with a past medical history of major depressive disorder is brought to the emergency department by her sister who found her unresponsive at her apartment. Upon arrival, her blood pressure is 120/80 mmHg, pulse 105/minute, respiratory rate 22/minute, and temperature 37.2 C. Fingerstick shows glucose of 35 mg/dl. After starting the dextrose infusion, the patient becomes responsive and opens her eyes spontaneously but refused to respond to questions. Her sister shows an empty bottle of glyburide and says, "I found this empty bottle next to her on the floor, and I think she ingested these tablets." Which of the following is most likely to be found on further laboratory testing?

## Choices:

1. Low insulin level, low C peptide
2. Normal insulin level, elevated C peptide
3. Elevated insulin level, low C peptide
4. Elevated insulin level, elevated C peptide

## Answer: 4 - Elevated insulin level, elevated C peptide

## Explanations:

- Glyburide is a drug in the class of sulfonylureas, used in the treatment of type 2 diabetes mellitus.
- Sulfonylureas work by stimulating beta cells of the pancreas to secrete endogenous insulin, that is usually secreted along with a C peptide chain.
- In someone who ingests sulfonylureas, both insulin and C peptide levels will be elevated in the blood.
- Another cause of elevated blood insulin level and C peptide is insulinoma, which results in an increase in endogenous insulin secretion as well as C peptide.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Factitious Hypoglycemia

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## Question 740:

A 25-year-old man is brought to the emergency department by paramedics. He was found on the street confused. On arrival, he is lethargic and has decreased mental status. He was not able to respond appropriately to questions. His vital signs show temperature 94.2°F, heart rate 72/min, respiratory rate 18/min, and blood pressure 85/60 mmHg. There are no obvious signs of trauma. His pupils are equal and reactive. A rapid bedside glucose level is 32 mg/dL. Initial laboratory evaluation reveals serum sodium level 128 mEq/L and potassium level 6.7 mEq/L. His serum ethanol level and urine toxicology screening are negative. He also has an elevated thyroid-stimulating hormone level. Which of the following complications is most likely to occur with the administration of levothyroxine in this patient?

## Choices:

1. Pancreatitis
2. Thyrotoxicosis
3. Myxedema coma
4. Adrenal crisis

## Answer: 4 - Adrenal crisis

## Explanations:

- Adrenal crisis presents with hypovolemia, hypotension, and acute cardiovascular collapse. This occurs due to renal sodium wasting, hyperkalemia, and loss of vascular tone. It is a severe endocrine emergency that should be promptly recognized and appropriately treated.
- Hypothyroidism decreases cortisol clearance, and administration of thyroid hormone can increase cortisol clearance.
- Thyroid hormone can accelerate glucocorticoid turnover. It increases metabolism including cortisol metabolism. Administration of thyroid hormone in patients with adrenal insufficiency without glucocorticoid replacement may precipitate an adrenal crisis.
- A high serum concentration of TSH in the absence of primary thyroid failure may be a feature of adrenal insufficiency.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Addison Disease

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## Question 741:

A 16-year-old with type 2 diabetes that was diagnosed at age 14 year is being seen at the diabetes clinic after a gap of 15 months. At her initial diagnosis, her A1c was 7.5% and she was prescribed metformin therapy. She reports not taking her medication because she has been losing weight on her own. She also reports waking up at night to use the bathroom and has been drinking more water as well. She also reports intermittent abdominal pain that seems to resolve on its own. On exam, her BMI is 38 mg/m2 and she has significant acanthosis on her neck and axillae. Her labs show an A1c of 12.2%, sodium of 143 meq/l, chloride of 101 meq/l, potassium of 3.6 meq/l, bicarbonate of 16 meq/l, blood urea nitrogen of 22 mg/dl, creatinine of 0.9 mg/dl, BG- 360 mg/dl, total cholesterol of 320 mg/dl and triglyceride levels of 7500 mg/dl. Which of the following is she most likely to develop?

## Choices:

1. Pancreatitis
2. Esophageal candidiasis
3. Inflammatory colitis
4. Celiac disease

## Answer: 1 - Pancreatitis

## Explanations:

- The patient in the vignette has worsened type 2 diabetes as evidenced by elevated A1c, weight loss, and symptoms of polyuria and polydipsia.
- Her laboratory profile is significant for hyperglycemia, elevated a1c, elevated total cholesterol, and a remarkably elevated triglyceride (TG) level.
- Severe hypertriglyceridemia can precipitate an episode of acute pancreatitis. Pancreatitis is thought to be from reduced blood flow to the pancreas from chylomicron sludge causing ischemia.
- Lipoprotein lipase (LPL) is the key enzyme involved in the breakdown of TG into free fatty acids. Insulin is a potent stimulator of LPL. Insulin resistance of lack of insulin thus causes increased TG levels and a level of >1000 mg/dl can precipitate an attack of pancreatitis. Insulin helps in lowering TG levels in patients with poorly controlled diabetes.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Pediatric Dyslipidemia

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## Question 742: A 7-year-old boy presents with short stature, bowing of legs, swelling of wrist, knee, and ankle. Which of the following skeletal x-rays is best suitable for the assessment of bone age?

## Choices:

1. Right foot and ankle
2. Left hand and wrist
3. Right hand and wrist
4. Left foot and ankle

## Answer: 2 - Left hand and wrist

## Explanations:

- The child is diagnosed as rickets. Rickets is a disease related to vitamin D deficiency. The child presents with short stature, bowing of legs, swelling of wrist, knee, and ankle. Vitamin D helps in the mineralization of cartilage. Radiographic screening is performed by frontal radiographs of the wrist and knees. Physis is widened, and metaphysis shows fraying cupping and irregularity. Epiphysis shows stunted growth. A radiograph of the left hand and wrist is widely used to assess bone age. Areas of ossification over the left hand and wrist correlate well with bone age. The left hand and wrist radiograph are preferred over the right side because most individuals are right-handed, and therefore the right side has a greater chance to be deformed.
- At birth, there is no ossification of any carpal bone. Although there is significant individual variability, the approximate ossification times of the carpal bones follow a predictable sequence, starting with the capitate and ending with the pisiform.
- The approximate ossification times for the carpal bones include capitate 1-3 months, hamate 2-4 months, triquetrum 2-3 years, lunate 2-4 years, scaphoid 4-6 years, trapezium 4-6 years, trapezoid 4-6 years, and pisiform, and 8-12 years. An easy way to remember is to start with the capitate and move in a counterclockwise direction on the palmar surface of the right wrist, excluding the pisiform.
- The ossification centers of the distal radius and distal ulna develop around one year and 5-6 years, respectively.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Bone Age

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## Question 743: Which of the following is the most effective method for off-loading diabetic foot ulcers?

## Choices:

1. Crutches
2. Removable cast walker
3. Half-shoe
4. Total contact cast

## Answer: 4 - Total contact cast

## Explanations:

- Adequate off-loading increases the likelihood of healing diabetic foot ulcers. Total contact casts are widely accepted as the gold standard method for off-loading diabetic foot ulcers. The casts work by transferring the weight bearing forces of the limb to the calf instead of the plantar surface of the foot.
- This protects foot ulcers from pressure as well as shear forces, both of which interfere with wound healing. Patients can ambulate without having to consciously avoid pressure in the area of the ulcer.
- Non-removable interventions have proven more effective than any other external pressure-relieving methods. These methods address patient non-compliance, which is a substantial obstacle to wound healing.
- Total contact casts generally are left on the limb for 1 week at a time and offer enduring protection for ulcers between applications.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Diabetic Foot Ulcer

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## Question 744:

A 38-year-old man presents to the clinic with a 6-month history of progressive worsening watery diarrhea and abdominal cramps. He has recently started to experience flushing especially affecting his face. Alcohol seems to trigger the flushing. His past medical history includes recurrent renal stones and parathyroidectomy for hyperparathyroidism 10 years ago. He was recently diagnosed with asthma. He was lost to follow up from the endocrine clinic for the last 8 years. Currently, he is only taking inhalers for asthma. His father had hyperparathyroidism and his sister was recently diagnosed with gastrinoma. On physical examination, he appears pale. His weight is 82 kg and his height is 184 cm. Blood pressure and pulse are within normal limits. Abdominal examination demonstrates hepatomegaly. A current set of investigations is shown below.

| | Patient value | Reference range |
|---|---|---|
| Parathyroid hormone | 25 pg/mL | 14-65 pg/mL |
| Adjusted calcium | 9.8 mg/dL | 8.5-10.2 mg/dL |
| Urinary 5-hydroxyindoleacetic acid | 28 mg/24 hours | 2-9 mg/24 hours |

Liver function is normal. A chest CT shows a right middle zone 2 cm lesion. Furthermore, there is hilar and mediastinal lymphadenopathy. Abdominal CT shows multiple lesions in the liver. Sample collected after bronchoscopy shows neuroendocrine tumor typical of carcinoid tumor. The patient undergoes lung mass resection. Which of the following is the next best step in the management of this patient?

## Choices:

1. Measure urinary 5-hydroxyindoleacetic acid every 3 months
2. Chest and abdominal CT every 3 months
3. Lanreotide
4. Adjuvant chemotherapy and radiotherapy

## Answer: 3 - Lanreotide

## Explanations:

- In this clinical vignette, the patient most likely has metastatic carcinoid. He is symptomatic. He has a family history suggestive of MEN1 or MEN4. Lanreotide is a somatostatin analog effective in controlling symptoms of carcinoid syndrome.
- Lanreotide can also slow the progression of carcinoid tumors.
- Repeated biomarkers and imaging will need to be undertaken. However, the patient is very symptomatic. Therefore, using a somatostatin analog like lanreotide is the best option.
- Carcinoids usually respond poorly to adjuvant chemotherapy and radiotherapy. Therefore, complete resection of the tumor remains the treatment of choice.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Multiple Endocrine Neoplasias Type 4

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## Question 745:

A 23-year-old woman presents to the clinic for bilateral elbow pain for the last year. She also reports a history of irritation in both eyes for one month. On examination, she has multiple small soft tissue swellings over the posterior aspect of both elbows. Plain x-ray shows multiple small calcific swellings around both elbow joints posteriorly without any bony abnormality or reduction of joint space. Serum calcium level is 10 mg/dL, and phosphate level is 13 mg/dL. Which among the following is the most likely pathogenic mechanism causing irritation in this patient's eyes?

## Choices:

1. Eye infection
2. Eye allergy
3. Conjunctival calcifications
4. Scleritis

## Answer: 3 - Conjunctival calcifications

## Explanations:

- Ocular involvement in hyperphosphatemic tumoral calcinosis has been well reported.
- Irritation or itching in the eyes can occur due to corneal/conjunctival calcifications.
- Retinal changes in the form of retinal angioid streaks have also been reported.
- Scleritis has not been reported in this disease. There is no history suggestive of eye infection/eye allergy.

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## Research Concepts:

### Hyperphosphatemic Tumoral Calcinosis

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## Question 746:

A 41-year-old man with osteoarthritis presents to the clinic for an annual complete physical examination. He has a BMI of 40.2 $kg/m^2$. He says he tried orlistat for obesity treatment but developed a lot of flatulence and diarrhea from it. He has lost 5 kg in 2 months and is willing to continue the medication. Which of the following additional medications is most appropriate to be prescribed to this patient?

## Choices:

1. Multivitamin supplement
2. Loperamide
3. Simethicone
4. Ondansetron

## Answer: 1 - Multivitamin supplement

## Explanations:

- Orlistat is a pancreatic and gastric lipase inhibitor that causes fecal loss of dietary fat in order to aid weight loss.
- Patients taking orlistat must be prescribed a multivitamin supplement that contains fat-soluble vitamins A, D, and E. Vitamin K can be supplemented if the patient is prone to bleeding complications.
- Patients who can tolerate the 60 mg dose three times daily and desire further weight loss can be put on a prescription-strength of orlistat at 120 mg three times daily with meals.
- Simethicone, loperamide, and ondansetron can only acutely treat symptoms but cannot be prescribed long term if the patient continues orlistat.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Non-dieting Approaches To Treatment Of Obesity

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## Question 747:

A 52-year-old female presents to the clinic for a follow-up appointment. She has a medical history of type 2 diabetes mellitus and takes metformin 500 mg daily as her only medication. She reports walking 2 miles each day and reports that though she has attempted to quit smoking in the past, she still smokes 1 pack each day. The patient reports that though she attempts to eat a balanced diet, she eats out 5 times each week as she travels for work often. She denies any alcohol use or illicit drug use. Vital signs are as follows: blood pressure is 130/80, heart rate is 85, respiratory rate is 20, and oxygen saturation is 97% on room air. Physical exam reveals decreased breath sounds throughout, and there is trace edema in her lower extremities bilaterally. Based on a prospective meta-analysis reporting on diabetes mellitus and cardiovascular risks, what is this patient's risk of developing coronary heart disease?

## Choices:

1. 64%
2. 54%
3. 44%
4. 34%

## Answer: 2 - 54%

## Explanations:

- The meta-analysis discussed that for patients with diabetes, smoking was found to increase the risk of developing coronary heart disease by 54%, with the risk for coronary heart disease directly proportional to the number of cigarettes smoked per day.
- The American Association of Diabetes states that smoking cessation is a significant step in preventing further complications of diabetes
- It has been found that smoking cessation itself decreases the risk of death associated with cardiovascular events compared to those individuals who continue to smoke.
- Additionally, smoking cessation reduces vascular risk in diabetic patients.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### How Can I Help My Patients With Type 2 Diabetes Mellitus Minimize Cardiovascular Disease Risk?

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## Question 748:

A 27-year-old female is brought to the emergency department after a motor vehicle accident. She does not have a history of loss of consciousness or seizures. On examination, her Glasgow coma scale score is 15, and she does not have any features of major organ injury. She has a lacerated wound in the right parietal region, which is sutured. A CT scan of the head shows an 8-mm sellar mass. All laboratory tests, including hormonal profiles, are normal. What is the most appropriate next step?

## Choices:

1. Refer the patient to neurosurgery
2. Repeat brain imaging in one year
3. Reassure the patient that no further evaluation is needed
4. Repeat laboratory tests in 6 months

## Answer: 2 - Repeat brain imaging in one year

## Explanations:

- The estimated prevalence of pituitary adenomas is 16.7%. Of these, 14.4% are found on autopsy and 22.5% on radiologic studies. If the adenoma is less than 1 cm, it can be followed annually by MRI. One-third of the pituitary adenomas greater than 1cm become invasive or have a mass effect, that is when surgery should be considered.
- Pituitary adenomas can be classified as microadenomas (less than 1 cm) or macroadenomas (greater than 1 cm). It is the macroadenomas that have a mass effect on the adjacent structures. If the pituitary gland itself is compressed, it can cause hypopituitarism. A macroadenoma can also cause the compression of the optic chiasm which would result in bitemporal hemianopsia. Headaches, cranial nerve palsies, and hydrocephalus due to blockage of the outflow of the third ventricle.
- The majority of secretory adenomas would secrete a single hormone. It is only a very few (1% to 2%) of these adenomas would secrete two or more hormones. An example of a common dual hormone secretion would be growth hormone and prolactin.
- The most common secretory adenoma would be prolactinomas. The bigger the secretory prolactin adenoma, the more hormone production there is. Prolactinomas can present with galactorrhea but may not always be present. The second most common secretory adenoma is growth hormone-secreting adenomas. This would be followed by ACTH secreting adenomas, gonadotrophic adenomas (LH and FSH), and thyrotroph tumors.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Anatomy, Adenohypophysis (Pars Anterior, Anterior Pituitary)

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## Question 749:

A 42-year-old woman presents to the clinic complaining of feeling a hand choking her anterior neck, occasional dry cough, and losing the quality of her voice and hoarseness while singing. Physical examination shows a bilaterally enlarged thyroid, but the lower border of the thyroid gland is not palpable. Thyroid function tests show thyroxine (FT4): 1.2 ng/dl (reference 0.8-1.8 ng/dl), tri-iodothyronine (FT3) 3.4 pg/dl (reference 2.8-4.4 pg/dl) and TSH: 1.63 micro IU/ml (reference 0.27-4.20 micro IU/ml). A thyroid ultrasound shows a bilateral enlargement of the thyroid, but the lower border of the right lobe is not defined. There are no thyroid nodules. CT scan of the neck and chest shows bilateral thyroid hyperplasia, and right-sided extension of the thyroid gland from the thoracic inlet to lower border of the right brachiocephalic vein, tracheal deviation, and minimum diameter of the trachea at the thoracic inlet is 7 mm. What is the next best step in the management of this patient?

## Choices:

1. Levothyroxine suppression treatment for a 6-month trial
2. Expectant monitoring with repeat thyroid function tests and CT of the chest in 6 months
3. Thyroidectomy
4. Endocrinology consultation

## Answer: 3 - Thyroidectomy

## Explanations:

- Levothyroxine treatment is not effective in the treatment of both cervical and intrathoracic goiter. Therefore, surgical resection is the appropriate treatment.
- Tracheal diameter is less than 10 mm, and the patient needs surgical intervention, usually executed via a cervical collar incision. Rarely, median sternotomy is used.
- Thyroid surgery by a high volume experienced surgeon is indicated due to severe tracheal compression.
- Thyroid fine-needle aspiration (FNA) is not recommended because it may cause bleeding and acute enlargement of thyroid tissue in the chest cavity and may trigger respiratory distress.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Substernal Goiter

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## Question 750:

A 29-year-old female presents to her primary care office for a follow-up appointment regarding her new onset of amenorrhea and increased hair falling out for 3 months. She denies any recurrent headaches. She has a known history of schizophrenia and takes risperidone. She is compliant with her medications. Two years ago she had a miscarriage followed by a normal vaginal delivery on her second pregnancy. She uses barrier protection during sexual intercourse to avoid pregnancy. Her mother has a history of thyroid disease. On physical examination, she has normal vital signs. She seems anxious but otherwise has a normal exam including a thyroid exam. A complete blood count and basic metabolic panel are within normal limits. A urine pregnancy test is negative. Thyroid ultrasound shows a normal-appearing thyroid without any abnormalities. Further laboratory studies are as follows: Prolactin - 170 ng/mL (Normal: 20 ng/mL in females); Thyroid-stimulating hormone (TSH) - 4.2 µU/mL (Normal: 0.5 - 5.0 µU/mL); and Free Thyroxine (T4) - 2.0 ng/dL (Normal: 0.9 - 2.4 ng/dL). Which of the following is the most appropriate next step in the management of this patient?

## Choices:

1. Start cabergoline
2. Stop risperidone
3. CT scan of the adrenal glands
4. MRI of the pituitary gland

## Answer: 4 - MRI of the pituitary gland

## Explanations:

- Antipsychotics, like riperidone, can raise the level of prolactin to levels even beyond 200 ng/mL. However, abrupt discontinuation of antipsychotics is not recommended and often times is not able to be disctoninued due to lack of alternatives and patient tolerance.
- MRI of the pituitary gland needs to be performed in cases of hyperprolactinemia to rule out pituitary tumor as the cause when medications that could cause hyperprolactinemia cannot be discontinued.
- Cabergoline and bromocriptine are the drugs of choice to treat prolactinomas. Inititiation of these medications first requires MRI evidence of a pituitary tumor with elevated serum prolactin levels, at least above 100 ng/mL.
- CT scan of the adrenals in unwarranted at this point without any evidence of corticotroph producing pituitary cancers. Hypothyroidism can hyperprolactinemia and benign homogenous increase in the size of the pituitary gland. This patient has labs and imaging that have ruled out hypothyroidism as a cause of her hyperprolactinemia.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Pituitary Cancer

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## Question 751:

An 18-year-old man presents to the clinic with on and off chest pain for the past few weeks. His father had a myocardial infarction at the age of 35 years. On further evaluation, he is found to have premature coronary artery disease. His labs show sodium 140 mmol/L, potassium 3.9 mmol/L, glucose 92 mg/dL, BUN 27 mg/dL, creatinine 1.1 mg/dL, GFR 60 L/min/1.73 kg, bilirubin 0.3 mg/dL, alkaline phosphatase 47 IU/L, AST 24 IU/L, ALT 26 IU/L, total cholesterol 300 mg/dL, LDL-cholesterol 240 mg/dL, HDL 46 mg/dL, and triglycerides 180 mg/dL. Which of the following evaluations is most likely to confirm the diagnosis in this patient?

## Choices:

1. Carotid intimal medial thickness measurement
2. Aortic calcific score
3. Testing for mutations in small LDL raising alleles (SNPs)
4. Testing for mutations in LDLR, APOB, PCSK genes

## Answer: 4 - Testing for mutations in LDLR, APOB, PCSK genes

## Explanations:

- Patients with familial hypercholesterolemia have mutations in LDLR, APOEB, and PCSK9 genes.
- The diagnostic criteria include (a) raised cholesterol levels, physical stigmata e.g., tendon xanthomata or, (b) disease-causing mutation is found, or (c) evidence of these signs in first- or second-degree relatives, and having a family history of premature coronary artery disease.
- Mutations in small LDL raising alleles are seen in a polygenic variety of familial hypercholesterolemia. It does not cause premature coronary artery disease. The condition is usually asymptomatic and is detected on routine screening.
- CIMT (carotid intimal medial thickness) is an age-related process or a media layer hypertrophic response to hypertension or other risk factors. CIMT above the 75th percentile of average for the age, gender, and ethnicity or absolute thickness of more than 1.0 mm is considered an abnormal result, and people with IMT in less than the 50th percentile are classified in the low-risk group. CIMT is a predictor of future cardiovascular and stroke events. It does not help in determining the diagnosis of familial hypercholesterolemia. Aortic calcific score measures the calcification burden in the aorta and determines the risk of future cardiovascular events. A score of 0 Agatston units is associated with low short-term event rate, and score >100 Agatston units is associated with a high event rate.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Polygenic Hypercholesterolemia

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## Question 752:

A 65-year old female presents to the emergency department complaining of left hip pain after slipping on ice. She is found to have right displaced femoral neck fracture and is planned for urgent surgery. Her medical history is remarkable for type 2 diabetes mellitus. Her home medications include metformin 1000 mg two times a day, canagliflozin 300 mg once a day, glimepiride 2 mg once a day. She is hemodynamically stable. Her random blood glucose is 280 mg/dL. What is the best method to manage her diabetes perioperatively?

## Choices:

1. Continue home regimen of metformin, canagliflozin, and glimepiride
2. Hold her home medications and start weight-based dose of basal insulin and correctional insulin
3. Hold canagliflozin and metformin but continue glimepiride
4. Hold metformin and glimepiride but continue canagliflozin

## Answer: 2 - Hold her home medications and start weight-based dose of basal insulin and correctional insulin

## Explanations:

- There is concern regarding the safety and efficacy of oral antihyperglycemic and non-insulin injectable in the perioperative setting. These patients are best managed by subcutaneous administration of insulin if hemodynamically stable (as seen in this clinical vignette) or intravenous administration of insulin if hemodynamically unstable.
- Metformin can lead to the development of lactic acidosis in cases of renal dysfunction, with the use of intravenous contrast, in hemodynamically unstable conditions, or during large fluid shifts that can happen intraoperatively.
- The risk of hypoglycemia with sulfonylureas such as glimepiride, especially when oral intake is inadequate, is unpredictable.
- Sodium-glucose cotransporter-2 inhibitors such as canagliflozin carry the risk of euglycemic ketoacidosis in fasting or acutely ill patients.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Diabetic Perioperative Management

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## Question 753:

A 55-year-old woman presents to the clinic for evaluation. She previously had a gastric band 20 years ago, which was removed 5 years ago due to erosion. Since the removal, despite the pain settling, she has unfortunately gained a significant amount of weight despite membership in an organized weight loss program. After further discussion, she requests malabsorptive bariatric surgery. Which of the following is the most appropriate recommendation for this patient?

## Choices:

1. Sleeve gastrectomy
2. Referral to a new program
3. Gastric bypass
4. Gastric balloon

## Answer: 3 - Gastric bypass

## Explanations:

- A gastric balloon is enclosed in a swallowable capsule, attached to a thin tube. Once the balloon has been swallowed, an x-ray is taken to confirm the correct position in the stomach. The balloon is then inflated with an inert solution via the thin tube, reducing the stomach's capacity. Once the balloon is filled, the thin tube is removed, and the process is complete. This is an example of a fully reversible restrictive option of bariatric surgery.
- Gastric bypass surgery is an example of a malabsorption bariatric procedure. It was first performed in 1967 as an open procedure. It is now safely performed laparoscopically with very good weight loss outcomes.
- Bypass surgery not only leads to weight loss by malabsorption of nutrients. It also changes the hormones that control appetite and the hormones that affect metabolic illnesses such as diabetes, high cholesterol, and polycystic ovarian syndrome. Due to this, gastric bypass is often recommended for patients with metabolic illnesses.
- Weight loss after bypass surgery is variable. It is affected by many patient factors, including age, activity level, and basal metabolic rate. But, on average, a typical woman who is 50 kg overweight will lose between 37 to 44 kg.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Counseling Patients On Bariatric Surgery For Obesity

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## Question 754:

A 65-year-old woman is being evaluated in the clinic. She has diabetic neuropathy, and her pain has been poorly controlled despite treatment. She has been on pregabalin, duloxetine, and amitriptyline but has had limited relief with these therapies. It is decided to start her on a novel agent administered intrathecally, which inhibits N-type calcium channels. History of which the following conditions is a contraindication for the use of this drug?

## Choices:

1. Ischemic heart disease
2. Chronic obstructive airway disease
3. Schizophrenia
4. Peptic ulcer disease

## Answer: 3 - Schizophrenia

## Explanations:

- This patient has chronic neuropathic pain that has not responded to first-line agents. The drug that is being considered is ziconotide, which is administered intrathecally and acts via N-type calcium channel inhibition.
- Severe neuropsychiatric and neurological symptoms can occur during treatment with ziconotide. Individuals who are started on treatment should be monitored for the development of cognitive dysfunction, hallucinations, or changes in mood or consciousness. Patients with a preexisting history of psychosis should not be treated with ziconotide.
- Treatment should be discontinued in individuals who develop neuropsychiatric symptoms. Reversal of side effects may take up to 2 weeks after discontinuation of the drug.
- Elderly patients are at increased risk of developing neurological symptoms. Ischemic heart disease, COPD, or peptic ulcer disease are not contraindications to ziconotide therapy.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Ziconotide

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## Question 755: A 30-year-old woman is assessed after missing several menstrual periods. She also states vaginal dryness and several episodes of non-bloody bilateral breast discharge. She has not had heat or cold intolerance or differences in hunger but does note decreased libido over the past several months. Medical history is unremarkable, and she takes no medications. On physical examination, the patient looks healthy. Vital signs are normal. BMI is 25. No skin rash or visual field defects are present. There is a nonbloody discharge from both nipples. The remainder of the examination is normal. A urine pregnancy test is negative. Which of the following is the most appropriate next diagnostic study?

## Choices:

1. Magnetic resonance imaging of the pituitary gland
2. Serum estrogen and progesterone measurement
3. Serum prolactin measurement
4. Serum FSH-LH measurement

## Answer: 3 - Serum prolactin measurement

## Explanations:

- The patient presents with hypogonadism secondary to Prolactinoma. Analysis of the serum prolactin level is the most appropriate next diagnostic step. Galactorrhea without evidence of an elevated serum HCG level is extremely indicative of a prolactinoma.
- Missed menstrual periods, vaginal dryness, and reduced libido also imply hypogonadism, which is likely due to reduced gonadotropin hormone secretion from the anterior pituitary gland (a frequent occurrence with a prolactinoma).
- Although prolactinomas may lead to bitemporal hemianopia, this finding only occurs if they enlarge adequately to compress the optic chiasm. A raised serum prolactin level would confirm the clinical the doubt that a prolactinoma is inducing central secondary hypogonadism in this patient.
- MRI of the pituitary gland will be a confirmatory test if the serum prolactin level is elevated. Serum estrogen and progesterone and FSH-LH measurements would likely be abnormal in this patient but would not explain the galactorrhea.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Prolactinoma

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## Question 756:

A 25-year-old woman with no past medical history presents to the clinic with a chief complaint of fatigue. She also describes weight gain, poor concentration, and generally feeling cold all the time despite everyone around her, saying it is warm. She also describes white discharge from her nipples. A urine pregnancy test is negative, TSH is 88 IU/mL, free T4 0.4ng/dL, and prolactin 50ng/mL. CT of the head done due to a motor vehicle accident one year ago showed a homogeneously enlarged pituitary gland. She reports no trouble with vision, and her visual fields are normal on the exam. Which of the following is the next best step in the management of this patient?

## Choices:

1. Prescribe levothyroxine
2. Transsphenoidal resection
3. Reassurance
4. Cabergoline

## Answer: 1 - Prescribe levothyroxine

## Explanations:

- The likely diagnosis is pituitary hyperplasia as a result of primary hypothyroidism, and the primary treatment is thyroid hormone replacement with close follow up repeating imaging and thyroid biochemistry after a while.
- Follow up is necessary as not only helps to confirm the diagnosis by showing regression in the size of the pituitary gland on MRI after the levothyroxine treatment, but it can also help to monitor any complications of the treatment.
- The thyroid biochemistry is consistent with primary hypothyroidism; the elevated prolactin is most likely as a result of the loss of feedback on the hypothalamus, causing elevated TRH and lactotroph hyperplasia. TRH will also cause thyrotrophin hyperplasia and thus enlargement of the pituitary gland.
- Surgery as a treatment modality is very rarely required, and 85% of patients have been shown in studies to have a reduction in the size of the pituitary gland with thyroid hormone replacement alone. Surgery is reserved for cases where there is the presence of compression of the optic chiasm with visual field defects making it sight-threatening or when there is no improvement with levothyroxine. Then the diagnosis needs to be revisited, and surgery may be required.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Pituitary Hyperplasia In Primary Hypothyroidism

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## Question 757:

A 21-year-old woman at 20 weeks of gestation presents to the clinic for her antenatal checkup. She reports that she was diagnosed with a rare genetic disorder of lipid metabolism in her childhood when she was hospitalized multiple times for recurrent attacks of epigastric pain. Since then, her symptoms have been well controlled with a diet with a fat intake of 15-20 grams per day. Her vital signs are within normal limits. On examination, a few yellow-colored plaques are noted over both her arms, her abdomen is non-tender with bowel sounds present. Lab results reveal non-fasting triglycerides 3000 mg/dL. Which of the following is the next best step in the management of this patient?

## Choices:

1. Continue her current dietary regimen
2. Restrict the daily dietary fat intake to less than 2 g/day
3. Atorvastatin
4. Increase daily exercise

## Answer: 2 - Restrict the daily dietary fat intake to less than 2 g/day

## Explanations:

- The female most likely has lipoprotein lipase deficiency, a rare genetic disorder of lipid metabolism marked by increased serum triglyceride levels, associated with chylomicronemia and high very-low-density lipoproteins. The majority of the cases present during childhood. Recurrent attacks of pancreatitis are the most common complaint as manifested in this patient as epigastric pain.
- The mainstay for the management is to follow a fat-restricted diet. The targeted goal is to keep the plasma triglyceride levels below 2000 mg/dL, with the greatest benefit obtained when the plasma triglyceride levels are kept below 1000 mg/dL. For non-pregnant individuals, this can be achieved by restricting the dietary fat intake to not above 20 g/day or 15% of total energy intake.
- Pregnant women need to follow an extreme fat-restricted diet, that is, less than 2 g/day, especially during the second and third trimesters. This, along which close monitoring of the plasma triglyceride levels, leads to the delivery of normal infants with normal plasma levels of essential fatty acids. A combination of a very low-fat diet with the use of gemfibrozil has been safely implicated in pregnancy.
- Other lipid-lowering drugs like statins or following an increased exercise routine has not proven to be beneficial for patients with lipoprotein lipase deficiency.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Lipoprotein Lipase Deficiency

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## Question 758:

An 11-year-old boy is brought to the clinic for evaluation. He has been a short child but otherwise healthy and active with a good academic performance. His mother's height is 147 cm. His parents are concerned that he may be lacking behind in pubertal development as well. During the current visit, his height measurement shows he is falling off a further percentile. His genital examination is still pre-pubertal with no scrotal skin changes, testicular enlargement, or pubic hair growth. His mother states the patient's cousin of a similar age has had the onset of puberty recently. Which of the following is the most appropriate method to assess the patient's growth hormone (GH) function?

## Choices:

1. GH stimulation using glucagon only
2. GH stimulation using glucagon and GHRH-arginine on 2 different occasions
3. GH stimulation after priming with 2 mg 17 beta-estradiol on each of the 2 days before the test on 2 occasions using 2 different stimulants
4. Serial GH levels over 12 hours

## Answer: 3 - GH stimulation after priming with 2 mg 17 beta-estradiol on each of the 2 days before the test on 2 occasions using 2 different stimulants

## Explanations:

- This boy has familial short stature as he is short and has a short parent. He also has a pubertal delay. A family history of pubertal delay in a first-degree relative may point to the co-existence of constitutional delay of growth and puberty (CDGP). However, it is prudent to exclude an endocrine cause like growth hormone deficiency (GHD) by appropriate testing.
- A full-blown GHD is easier to diagnose than a partial GHD. It is difficult to differentiate familial short stature (FSS), CDGP, and partial GHD with the current GH stimulatory tests, which at present lack the sensitivity for this purpose.
- Pre-pubertal children with CDGP often have a poor response to GH stimulation tests. When primed with sex-steroids, the response in normalized in the majority. The false-positive rates are diminished from 61% to 5% with this maneuver. Unnecessary treatment with rGH to CDGP children will be prevented by sex-steroid priming before GH stimulation tests.
- CDGP can co-exist with FSS in many children as in this boy. They are brought to attention, especially around puberty, when there is a fall back in both growth and puberty. An international consensus recommends peri-pubertal boys above age 11 years and girls above 10 years undergo sex-steroid priming before GH stimulation tests. An alternative to 17 beta-estradiol in boys is to use a single injection of 50-100 mg testosterone on the day before the stimulation test.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Familial Short Stature

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## Question 759:

A 17-year-old male is admitted to the emergency department for diabetic ketoacidosis. He is started on insulin therapy and administered a dextrose solution intravenously. Several hours after admission, the patient is complaining of excruciating pain in his antecubital fossa around the intravenous site. Physical examination reveals the skin around the intravenous line has become violaceous with a mottled appearance. Which of the following drugs may help prevent tissue necrosis caused by the extravasation of concentrated dextrose solution?

## Choices:

1. Lidocaine
2. Pancreatic lipase
3. Hyperbaric oxygen
4. Hyaluronidase

## Answer: 4 - Hyaluronidase

## Explanations:

- Highly concentrated dextrose can result in skin necrosis if extravasation occurs due to its highly acidic properties.
- Hyaluronidase increases both the distribution and absorption of locally injected substances.
- It modifies the permeability of connective tissue through hydrolysis of hyaluronic acid.
- It is also used for extravasated chemotherapy.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hyaluronidase

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## Question 760:

A 40-year-old male presents to the clinician for a wellness exam. He states he has no active complaints and says he feels fine. He exercises 2-3 times weekly at the gym and goes for a morning walk daily. He, however, says he does not watch what he eats and tries to take vitamin supplements whenever he can remember. Physical examination is non-contributary. Further laboratory evaluation is not significant, except for a calcium level of 11.6 mg/dL. Which of the following is the next best step in management?

## Choices:

1. Volume repletion with normal saline
2. Administration of Zoledronic acid
3. No management required
4. Administration of loop diuretics

## Answer: 3 - No management required

## Explanations:

- Hypercalcemia can be classified into mild hypercalcemia ( calcium levels of 10.5 to 11.9 mg/dL), moderate hypercalcemia (calcium levels of 12.0 to 13.9 mg/dL), and hypercalcemic crisis (calcium levels of 14.0 to 16.0 mg/dL).
- Treatment for hypercalcemia is required if the patient is symptomatic or if the calcium level is more than 15 mg/dL, even in asymptomatic patients.
- The goals of treating hypercalcemia include increased elimination from the extracellular fluid, reducing gastrointestinal (GI) absorption and decreasing bone resorption.
- As the patient in the given scenario is not experiencing any symptoms, management is not required at this time. Serum calcium levels need to be followed up.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hypercalcemia

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## Question 761:

A 46-year-old woman presents to the office due to concerns about recent appearance changes. During the physical exam, a fatty hump between her shoulders, a rounded face, and pink or purple stretch marks on the abdomen are noted. The patient is currently being treated for previously diagnosed hypertension, hyperlipidemia, and type 2 diabetes mellitus. She is currently taking hydrochlorothiazide, lisinopril, simvastatin, metformin, and glimepiride. Bloodwork reveals persistently elevated blood sugar levels. Mifepristone is added to her medication regimen. Which of the following lab abnormalities is most likely to occur in this patient?

## Choices:

1. Decreased cortisol levels
2. Increased aldosterone
3. Hyperkalemia
4. Hypokalemia

## Answer: 4 - Hypokalemia

## Explanations:

- Mifepristone is used in patients with increased cortisol levels. This is due to its activity as a glucocorticoid receptor antagonist. By competitively binding to the glucocorticoid receptors, the cortisol in the blood remains there, and cortisol levels rise.
- Mifepristone disinhibits the negative feedback of glucocorticoids on ACTH and CRH secretion, leading to excessive cortisol production.
- Mifepristone is a potent antagonist of glucocorticoid receptors. Its use has a high risk of adrenal insufficiency, despite high cortisol levels. The hypokalemia disturbances are due to a "spill-over" effect of cortisol on unopposed mineralocorticoid receptors.
- Mifepristone has no effect on the mineralocorticoid receptors. Thus, aldosterone levels should not be affected.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Mifepristone

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## Question 762: A researcher wants to compare serum levels of brain natriuretic peptide (BNP) and NT-proBNP in individuals with no evidence of cardiac disease. Which of the following trends is she likely to observe?

## Choices:

1. Higher levels of both peptides in obese patients
2. Higher levels of NT-proBNP in patients over the age of 50 years
3. Higher levels of BNP in males
4. No significant difference between BNP and NT-proBNP levels given age, gender, or BMI

## Answer: 2 - Higher levels of NT-proBNP in patients over the age of 50 years

## Explanations:

- BNP and NT-proBNP levels vary among healthy populations based on age, gender, and BMI.
- Given the longer half-life of NT-proBNP, its serum levels are higher than that of BNP.
- A higher range of values for NT-proBNP is considered normal for patients over 50 years because its levels are increased with age.
- Both BNP and NT-proBNP levels are lower in obese patients than patients with a normal BMI. Levels of the peptides are higher on average in females than males.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Natriuretic Peptide B Type Test

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## Question 763:

A 26-year-old man presents to the clinic with complaints of the right arm pain for 5 months. He has no known past medical illnesses. The physical exam shows tenderness over the proximal arm. The radiologic finding reveals a lytic lesion in size of 2x3 cm in proximal of humorous. On laboratory analysis, serum calcium level 11.6 mg/dl, serum albumin level 5.1 g/dl, serum alkaline phosphatase level 860 IU/l, and serum parathyroid hormone level 556 pg/ml. Which of the following is the most appropriate next step in management?

## Choices:

1. Ultrasound of parathyroid gland
2. Parathyroidectomy
3. Bone biopsy
4. Genetic test to rule out multiple endocrine neoplasias

## Answer: 1 - Ultrasound of parathyroid gland

## Explanations:

- Osteitis fibrosa cystica (OFC) is due to the overproduction of parathyroid hormone (PTH) in the setting of primary, secondary, and tertiary hyperparathyroidism (HPT), causing a skeletal disorder.
- Diagnosis of HPT is based on laboratory findings of increased serum PTH levels, hypercalcemia, hypophosphatemia, and normal or highly increased alkaline phosphatase levels. Plain radiographs distinctly may show thin bones (osteopenia or osteoporosis), fractures, bowing, and cysts, and the skull depicts the “ground glass”/“salt and pepper” appearance. Ultrasound, CT scan, or technetium scan techniques also used to detect the diseased parathyroid gland.
- The first step in the management of osteitis fibrosa cystica is the treatment of hyperparathyroidism. The treatment of choice for HPT is parathyroidectomy after the treatment of the underlying metabolic disorder.
- Hyperparathyroidism, if occurring in the younger (especially first decade) age group, hereditary causes like multiple endocrine neoplasias must be ruled out.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Osteitis Fibrosa Cystica

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## Question 764:

A 56-year-old African American woman presents to the clinic after a few episodes of feeling extremely hot and sweaty. She gets these episodes at least 6- 8 times a day. She also complains of palpitations and feeling anxious. She has a past medical history of hypothyroidism and takes levothyroxine 100 mcg daily. She has not seen a clinician in the last 18 months. She had her menopause at the age of 44 and had hot flashes in the past but were infrequent and not this bothersome. Her TSH is 1.0 mU/L. Which of the following is the next best step in the management of this patient?

## Choices:

1. Decrease the dose of levothyroxine
2. Oral estrogen replacement
3. Transdermal estrogen replacement
4. Paroxetine

## Answer: 4 - Paroxetine

## Explanations:

- Women younger than 60 years or within 10 years of menopause are candidates for hormone therapy as the risk of the adverse effect is minimal in this group.
- Nonhormonal therapy is preferred when initiating treatment in women above 60 years of age and more than 10 years post-menopausal.
- Escitalopram and paroxetine ER and venlafaxine XR are the most effective nonhormonal treatments.
- No diagnostic evaluation is necessary for typical menopausal symptoms. The patient's TSH is within the goal range of 0.5-2.5 mU/L in hypothyroidism.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Postmenopausal Syndrome

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## Question 765:

A 36-year-old woman with several Achilles tendon xanthomas presents to the clinic for follow-up. She was prescribed a trial of atorvastatin without any improvement in her LDL cholesterol of 180 mg/dL. Her last lipid panel showed total cholesterol of 245 mg/dL and non-HDL cholesterol of 210 mg/dL. Genetic testing reveals mutations in both ABCG5 and ABCG8 genes. Ezetimibe is added to the patient's regimen. Which of the following is the next best step in the management of this patient?

## Choices:

1. Ultrasound of spleen
2. Plant sterol levels
3. Echocardiogram
4. Stress testing

## Answer: 2 - Plant sterol levels

## Explanations:

- Coronary artery calcium score or angiography can be useful for evaluating additional cardiovascular risk.
- Plant sterol levels are useful in individuals who have a confirmed diagnosis of sitosterolemia because they can show if dietary changes are adequately adjusted or if a bile acid sequestrant needs to be initiated for adjunct therapy to ezetimibe.
- Various clinical findings may be noted in an individual with sitosterolemia, such as splenomegaly, hemolytic anemia, thrombocytopenia, or tendon xanthomas.
- Stress testing, echocardiogram, and spleen ultrasound provide no additional benefit to an asymptomatic individual in need of risk refinement.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hereditary Sitosterolemia

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## Question 766:

A 53-year-old man is diagnosed with primary hyperaldosteronism due to an aldosterone-producing adenoma. The chronic volume expansion is corrected, and mineralocorticoid antagonists are discontinued before surgery. As part of his localizing studies, a preoperative adrenal venous sampling was performed after ACTH stimulation and results are as follows: cortisol: left adrenal vein 1000 mcg/dL, right adrenal vein 1500 mcg/dL, peripheral vein(external iliac) 100 mcg/dL; aldosterone: left adrenal vein 600 ng/dL and right adrenal vein 4500 ng/dL, peripheral vein(external iliac) 300 ng/dl. Which of the following postoperative complications is likely to occur in this patient?

## Choices:

1. Transient hypoaldosteronism
2. Protracted hypoaldosteronism
3. Transient combined hypoaldosteronism and hypocortisolism
4. Protracted combined hypoaldosteronism and hypocortisolism

## Answer: 2 - Protracted hypoaldosteronism

## Explanations:

- This patient has undergone a successful adrenal venous sampling, both adrenal veins have been cannulated, and adequate samples obtained. The rise in cortisol several-fold (10 fold and 15 fold in the left and right adrenal veins respectively) compared to the periphery after ACTH stimulation confirms this and is used as a positive control for this test.
- The ratio of ALD to cortisol on each side is the normalized ALD level (600/1000=0.6 on the left and 4500/1500=3.0 on the right). The ratio of the normalized levels of ALD on the two sides gives the ALD lateralization index (LI), which is 0.6/3.0=0.2 for the left and 3.0/0.6=5.0 for the right. Therefore, it is clear that the right adrenal gland is overproducing aldosterone (ALD).
- The contralateral suppression index(CSI) is determined by the ratio of the aldosterone levels(corrected for cortisol levels) in the suppressed left adrenal and the periphery. In a study of patients undergoing unilateral adrenalectomy for ALD producing adenoma, it was shown that a CSI of less than 0.47 was predictive of a protracted course of suppression of ALD secretion from the chronically suppressed gland contralateral to the adenoma. In this case, the CSI of the left is 0.2( 600/1000 divided by 300/100), and protracted hypoaldosteronism (HA) is likely and should be watched for diligently.
- Other predictors of protracted HA are advanced age, large adenoma, long-standing hypertension, and both pre and postoperative renal function. Uncorrected chronic volume expansion and not stopping aldosterone antagonists before surgery are added risks. The cortisol reserves are unaffected in primary aldosteronism, as seen in the brisk response to ACTH in this patient, and hydrocortisone supplementation is therefore unnecessary.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hypoaldosteronism

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## Question 767:

A 48-year-old male with a history of severe persistent asthma was admitted to the intensive care unit for an acute asthma exacerbation requiring intubation. The patient experienced severe bronchospasm and was noted to be difficult to intubate with profound agitation, requiring intermittent doses of cisatracurium, along with heavy analgesia and sedation with fentanyl, propofol, and intermittent boluses of midazolam. He received high-dose intravenous corticosteroids for 7 days for the asthma exacerbation, which are currently being tapered, along with broad-spectrum antibiotics for presumed ventilator-associated pneumonia. His respiratory status stabilizes and he is extubated on day 14. After extubating, he is noted to be profoundly weak and unable to raise his arms over his head. There are no sensory deficits and no focal neurological signs, he is otherwise alert and oriented, and lungs are clear to auscultation. His creatine kinase (CK) levels were monitored throughout the admission and have remained normal. Basic labs are within normal limits. Minimizing the use of which of the following medications would be recommended to prevent this condition?

## Choices:

1. Fentanyl
2. Cisatracurium
3. Propofol
4. Midazolam

## Answer: 2 - Cisatracurium

## Explanations:

- Curare-like paralytic agents (such as cisatracurium), when used with corticosteroids, can cause an acute myopathy in the intensive care setting.
- Minimizing the use of curare-like paralytics is recommended when administering systemic corticosteroids.
- Creatine kinase is only rarely elevated in the setting of acute steroid myopathy in the intensive care setting; thus, the normal CK level is reassuring of steroid-induced myopathy.
- Propofol can be associated with an acute myopathy, typically CK levels are elevated along with evidence of renal dysfunction and metabolic acidosis.

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## Research Concepts:

### Corticosteroid Induced Myopathy

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## Question 768: A middle-aged male has just been diagnosed with type 2 diabetes mellitus. He has not always been physically active in the past, and his body mass index is 30.5. Aside from diabetes, he also has elevated levels of cholesterol and hypertension. He wants to perform some resistance training and aerobics to help him lose weight. If he has no contraindications, what is the current American Diabetes Association (ADA) position on such exercise in patients with type 2 diabetes mellitus?

## Choices:

1. Must be done at least three times per week
2. Aerobic exercise is not recommended
3. Should only be done with supervision at a rehab center
4. To get the most benefits, exercise should be combined with a glucagon-like peptide-1 receptor agonist

## Answer: 1 - Must be done at least three times per week

## Explanations:

- First, there are no universal guidelines on the type or duration of exercise in patients with diabetes mellitus. Most health care experts recommend aerobics and strength training at least three times a week.
- Others state that at least 90 to 150 minutes of exercise should be done each week. The type of exercise may be aerobics or resistance training.
- Unfortunately, less than 12% of adult patients with diabetes mellitus meet these recommendations.
- There is evidence showing that exercise for 150 minutes a week can reduce the hemoglobin A1c by 0.89%, which is just as good as most medications. As the patient has diabetes mellitus and is over 40 years, he should start on a statin.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Diabetes Mellitus And Exercise

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## Question 769:

A 16-year-old male presents to his provider, accompanied by his mother. He mentions that she is concerned as he is short in comparison to his peers, and "has not grown much in the last year." The boy is not yet sexually active. On examination, he has no facial or axillary hair present; both testes are descended but small in size. Laboratory workup reveals a follicular stimulating hormone (FSH) is 12.7 IU per liter, and the luteinizing hormone (LH) level is 22.4 IU per liter. Which of the following causes is responsible for his delayed development?

## Choices:

1. Exogenous steroid use
2. An estrogen secreting tumor
3. Cryptorchidism
4. Genetic mutations in the FSH (follicle-stimulating hormone), and LH (luteinizing hormone) receptor

## Answer: 4 - Genetic mutations in the FSH (follicle-stimulating hormone), and LH (luteinizing hormone) receptor

## Explanations:

- Mutations in the FSH (follicle-stimulating hormone) and LH (luteinizing hormone) receptor can cause the receptor to be non-functional, leading to elevated levels of FSH and LH.
- Genetic mutations are a possible cause of delayed puberty. This patient has evidence of delayed puberty with little secondary sexual characteristic development at the age of sixteen.
- Secondary sexual characteristics include facial and axillary hair development. This patient also shows other signs of delayed puberty, including small testes size and lack of linear growth.
- Cryptorchidism is also a possible cause of delayed puberty; however, this boy has both testes descended. An estrogen secreting tumor can cause contrasexual development, not delayed puberty. Exogenous steroids would cause premature signs of puberty note delayed.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Physiology, Puberty

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## Question 770:

An 88-year-old male with a past medical history of gastritis, hypertension, unsteady gait, and chronic hyponatremia arrives in the emergency department with productive cough and fever 39.0 C. Past laboratory workup for hyponatremia had been negative. Current medications include omeprazole, lisinopril, and furosemide. On physical examination, the blood pressure was 180/100 mmHg with a heart rate of 88 bpm. The initial laboratory test presents with blood sodium levels of 125 mmol/L. Chest X-ray revealed cardiomegaly with clear lung fields. The head computed tomographic scan is normal. He is admitted after sputum and blood cultures were taken. Initial treatment with antibiotics was started. To correct the hyponatremia, he is placed on fluid restriction to 800 cc per day. Still, after no response, he is doubled his daily furosemide dose, and angiotensin-converting enzyme inhibitors are added. Two days later, the blood sodium level remains at 125 mmol/L. What is the best next step in the management of this patient?

## Choices:

1. Re-assess plasma and urine osmolality with water deprivation test
2. Order adrenocorticotrophin hormone levels
3. Discontinue omeprazole
4. Order a thyroid-stimulating hormone levels

## Answer: 3 - Discontinue omeprazole

## Explanations:

- Omeprazole is a notable etiology for hyponatremia due to the syndrome of inappropriate antidiuretic hormone secretion.
- Pantoprazole, another proton pump inhibitor, can also cause SIADH secretion. Other medications from this class should not be prescribed if needed.
- SIADH secretion is responsible for 46% of the cases of hyponatremia, which is the most common electrolyte abnormality.
- Other causes of hyponatremia (adrenal insufficiency, hypothyroidism, cardiac failure, hepatic damage, renal disease, pituitary dysfunction, drugs) must be excluded. This patient had chronic hyponatremia, and past laboratory workup had been negative.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Neurohypophysis

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## Question 771: A 48-year-old woman with obesity (BMI 32 kg/m2) intends to start a diet regimen for weight loss as advised by her nutritionist. The diet consists of low carbohydrate, moderate protein, and high fat. She does not have any other medical comorbidity. Which of the following best describes the expected metabolic changes as a result of this diet?

## Choices:

1. Insulin levels will increase and glucagon will decrease
2. Insulin level will decrease and glucagon will decrease
3. Insulin level will increase and epinephrine will increase
4. Insulin level will decrease and glucagon will increase

## Answer: 4 - Insulin level will decrease and glucagon will increase

## Explanations:

- The diet advised by the nutritionist is a ketogenic diet. With minimal dietary carbohydrates, insulin release decreases, and glucagon increases.
- Glucagon facilitates glycogenolysis for energy.
- Eventually, when blood glucose and liver glycogen stores are low, there is fatty acid oxidation and production of ketones in the liver as an alternate energy source.
- Epinephrine and glucagon facilitate lipolysis and ketogenesis. Insulin acts as an opposing hormone.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Ketogenic Diet

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## Question 772:

A 4-month-old baby is brought to the clinic by his mother with a complaint of recurrent thrush. The baby is below the fiftieth percentile for weight and height. The mother complains that the baby has always been sick since being born. He also has feeding problems due to a cleft palate and had a cardiac defect that had to be repaired at two weeks of age. Which of the following physiologic processes is most likely affected in this patient?

## Choices:

1. Renin-angiotensin-aldosterone system
2. Serum calcium homeostasis
3. Hypothalamic-pituitary-adrenal axis
4. Signaling pathway of steroid hormones

## Answer: 2 - Serum calcium homeostasis

## Explanations:

- This patient has most likely a DiGeorge syndrome. It is caused by 22q11 deletion, which results in failure to develop 3rd and 4th pharyngeal pouches. Failure of development of the 3rd and 4th pharyngeal pouches results in absent thymus and parathyroids. The parathyroid glands secrete parathyroid hormone (PTH).
- The parathyroid hormone plays a major role in calcium homeostasis and the regulation of serum calcium levels. As serum calcium levels decrease, PTH levels will increase to return serum calcium levels to normal. PTH also plays a role in Vitamin D levels, which helps regulate serum calcium levels.
- Failure of development of parathyroid gland leads to low serum calcium levels. Weakness, paresthesias, muscle cramps or tetany, and seizures can all result from severe hypocalcemia.
- DiGeorge syndrome patients present with specific facial features, such as an underdeveloped chin, low-set ears, wide-set eyes, and cleft palate. In addition to that, the severe comorbidities include tetany (hypocalcemia), recurrent viral/fungal infections (T-cell deficiency), conotruncal abnormalities (e.g., tetralogy of Fallot, truncus, arteriosus).

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Physiology, Parathyroid

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## Question 773:

A 41-year-old female with a past medical history of total thyroidectomy secondary to thyroid cancer performed 5 years ago. She was prescribed levothyroxine at weight-based dosing. She does admit she often forgets to take this medication. Thyroid biochemistry done one week ago shows a thyroid-stimulating hormone of 85 IU/mL, and free T4 levels were below the lower limit of normal. She was complaining of galactorrhea, and a prolactin level was checked and was noted to be 54 ng/mL. An MRI of her brain demonstrated a homogeneously enlarged pituitary gland. What is the most likely cause of her enlarged pituitary?

## Choices:

1. Prolactinoma
2. TSH-secreting adenoma
3. Thyrotroph hyperplasia
4. Pituitary non-functioning macroadenoma

## Answer: 3 - Thyrotroph hyperplasia

## Explanations:

- Studies have shown that up to 81% of patients with hypothyroidism have pituitary hyperplasia as a result of the loss of negative feedback on the hypothalamus resulting in elevated thyroid-releasing hormone (TRH) and thyrotroph hyperplasia.
- Prolactin levels are often elevated in those patients with primary hypothyroidism with resultant pituitary hyperplasia due to low circulating thyroid hormone levels resulting in a lack of negative feedback on the hypothalamus, resultant TRH production increase and stimulation of both thyrotroph and lactotroph hyperplasia.
- There has been evidence that shows a potential correlation exists between how high the TSH value is and the likelihood of developing pituitary hyperplasia. One study evaluated those with TSH above 50 IU/mL, 70% of these patients had pituitary enlargement as noted on MRI.
- Recognizing this entity of pituitary hyperplasia as a result of primary hypothyroidism is important because it is mostly under-recognized, and the primary modality of treatment is thyroid hormone replacement with a vast majority of patients (studies showing up to 85%) showing a reduction in pituitary size on follow up.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Pituitary Hyperplasia In Primary Hypothyroidism

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## Question 774:

A 65-year-old man presents with progressive dyspnea, hemoptysis, and 10 kg weight loss over the past 6 months. He also admits to intermittent abdominal pain, nausea, and headache over the past week. He denies hematuria. His past medical history is significant for hypertension and tobacco use disorder (40-pack-years). Laboratory studies include sodium 140 mEq/L, potassium 3.7 mEq/L, chloride 103 mEq/L, calcium 13 mg/dL, phosphorus 1.8 mg/dL, BUN 15 mg/dL, creatinine 0.9 mg/dL, and hemoglobin 14.4 g/dL. Which of the following is most likely responsible for this patient's lab abnormalities?

## Choices:

1. Squamous cell carcinoma
2. Parathyroid adenoma
3. Bladder cancer
4. Renal cell carcinoma

## Answer: 1 - Squamous cell carcinoma

## Explanations:

- Hypercalcemia of malignancy is the most common cause of rapidly progressive hypercalcemia. Symptoms, if present, include nausea, vomiting, headache, altered mental status, confusion, abdominal pain, constipation, myalgia, and polyuria.
- Hypercalcemia of malignancy is commonly due to a paraneoplastic syndrome. The most common of these is the release of parathyroid-related peptide (PTHrP) by the primary tumor. Squamous cell carcinomas commonly release this compound, but it can also be seen in other solid tumors involving the genitourinary tract. Other causes of hypercalcemia of malignancy include ectopic vitamin D production due to increased 1-alpha-hydroxylase activity and osteolytic bone metastasis.
- PTHrP is classically released from squamous cell carcinomas. It mimics parathyroid hormone in structure and function. Negative feedback is uncommon, and as a result, significant elevations in serum calcium can be seen.
- Parathyroid adenomas are the most common cause of primary hyperparathyroidism. Urothelial tumors are common in chronic tobacco users but are only rarely associated with hypercalcemia. Renal cell carcinomas may secrete PTHrP but classically present with hematuria.

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## Research Concepts:

### Malignancy-Related Hypercalcemia

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## Question 775:

A 41-year-old female presents to the emergency room with a 3-day history of diffuse abdominal pain, nausea, and vomiting. She was diagnosed with diabetes mellitus a year ago and was started on an oral medication. Two months ago, the medication was discontinued as her diabetes was not well controlled, and a newer oral agent was substituted. A month later, she developed dysuria, frequency, and urgency. A diagnosis of uncomplicated cystitis was made and treated successfully. A urinalysis after completion of treatment showed no leucocytes but 3+ glucose( her corresponding fasting blood glucose was 146 mg/dl). Physical examination at the ER: BMI 21 kg/m2, conscious, oriented, in apparent distress, moderately dehydrated. Investigations during her current visit revealed blood glucose 234 mg/dl, serum electrolytes; sodium 128 meq/l, potassium 4.1 meq/l, chloride 95 meq/l, and bicarbonate 12 meq/l, serum and urinary ketones strongly positive, serum glutamic acid decarboxylase antibody (GADA) strongly positive. She is admitted to the intensive care unit. Which is the best treatment option for this patient?

## Choices:

1. Start insulin but continue her current medication in the same dose
2. Start insulin but reduce the dosage of her current medication by half
3. Start insulin but double the dosage of her current medication
4. Start insulin and discontinue her current medication

## Answer: 4 - Start insulin and discontinue her current medication

## Explanations:

- Age of onset above 35 years, not requiring insulin initially for more than 6 months after diagnosis, and a lower BMI all favor a diagnosis of latent autoimmune diabetes of adults(LADA) in this patient.
- The medication started two months prior is an SGLT2 inhibitor. Increased urinary tract infections are observed with the use of this agent as seen in this patient.
- Her current presentation euglycemic diabetic ketoacidosis (eDKA)(blood glucose below 250 mg/dl, ketonemia, ketonuria, and a high anion gap acidosis) is a complication of SGLT2 inhibitors.
- SGLT2 inhibitors lower the renal threshold for glucose and cause glycosuria. This was noticed in this patient's urinalysis. Although the mechanisms underlying eDKA is not established, a shift from carbohydrate to fat utilization and oxidation and consequent hyperglucagonemia may be responsible. This can occur when insulin requirements increase during intercurrent illness, for instance. In LADA, when islet cell destruction progresses to the point of requiring insulin, the use of SGLT2 inhibitors can lead to eDKA and should be avoided.

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## Research Concepts:

### Latent Autoimmune Diabetes

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## Question 776:

A 22-year-old woman with Hirschsprung disease presents with leg pain, headaches, diaphoresis, and palpitations. Her past medical history is significant for a glioma resected 5 years ago. Physical examination reveals no abnormalities The vital signs reveal blood pressure of 160/100 with a pulse of 106 bpm. Laboratory studies show elevated serum levels of calcium and PTH. An X-ray of the leg reveals a fracture of the right tibia. A CT scan of the patient's neck demonstrates a solitary parathyroid mass and a CT scan of the abdomen displays a 3.5-cm mass in the left adrenal. Genetic studies conducted in this patient would reveal which type of inheritance?

## Choices:

1. Autosomal dominant
2. Autosomal recessive
3. X-linked recessive
4. X-linked dominant

## Answer: 1 - Autosomal dominant

## Explanations:

- The patient is most likely having MEN 2A syndrome, which is inherited by an autosomal dominant gene. Patients with MEN syndrome 2 have gene mutations that make them susceptible to neoplasia in multiple organs. Patients with MEN-2A (Sipple syndrome) have chromaffin cell-derived pheochromocytoma and C-cell derived medullary thyroid carcinoma and parathyroid hyperplasia or adenoma. Mutations of the RET protooncogene, a transmembrane receptor of the tyrosine kinase family, are responsible for MEN-2 syndromes. The germline RET mutations in MEN2 result in a gain of function of the tyrosine kinase receptor (Rearranged During Transfection protein).
- One-third of patients also exhibit hyperparathyroidism as a result of parathyroid hyperplasia or adenoma which is evident by the parathyroid mass in this patient. Hypertension and mass in the adrenal gland indicates pheochromocytoma.
- Hirschsprung disease (congenital megacolon) and a variety of neural crest tumors (e.g., glioma) are also seen in patients with MEN-2A. Hirschsprung disease (HD), also known as chronic aganglionic megacolon, also is associated with MEN2A. It is characterized by the absence of autonomic ganglion cells within the parasympathetic chain of the sigmoid colon, resulting in peristalsis, chronic obstruction, and megacolon
- The major cause of death in these patients is a delayed diagnosis of medullary cancer of the thyroid. Pheochromocytoma needs to be aggressively treated to prevent hypertensive morbidity. The other choices are not the inheritance patterns of MEN syndrome.

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## Research Concepts:

### Multiple Endocrine Neoplasias Type 2

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## Question 777:

A 34-year-old female in her second pregnancy presents to the clinic in the 26th week of gestation. She currently complains of some mild aches in her lower back and swelling in the extremities, especially with long-standing. Otherwise, she is enjoying good health in her pregnancy and looking forward to delivery. Her temperature is 36.6 C (98 F), blood pressure is 110/65 mmHg, heart rate is 86 beats/min, and respiratory rate is 18 breaths/min. The patient is given a 50 g glucose tablet to ingest, and her glucose level is 155mg/dl after 1 hour. What is the ideal next step in the management of this patient?

## Choices:

1. Commence pharmacologic treatment with subcutaneous insulin glargine
2. Perform a 3 hour 100 g glucose tolerance test
3. Recommend induction of labor within a week
4. Commence pharmacologic treatment with sulfonylureas

## Answer: 2 - Perform a 3 hour 100 g glucose tolerance test

## Explanations:

- Gestational diabetes is confirmed when fasting blood glucose levels are higher than 95 g/dl, and any 2 readings are abnormal in 3 hours glucose tolerance test. The results of the 3 hours glucose tolerance test are; glucose level after 1 hour greater than 180mg/dl, glucose level after 2 hours greater than 155mg/dl, glucose level after 3 hours greater than 140mg/dl.
- The 3-hour glucose tolerance testing is the confirmatory test for gestational diabetes, and it should be performed in pregnant patients with abnormal screening 1-hour oral glucose testing.
- Early and accurate diagnosis of gestational diabetes is very critical, and it dictates further the tone of care needed during the pregnancy.
- The care of patients diagnosed with gestational diabetes is not limited to pharmacological regimens only. Instead, a combination of a proper diet and insulin will also help to decrease the risk of macrosomia significantly.

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## Research Concepts:

### Gestational Diabetes

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## Question 778:

A 54-year-old woman with a history of Roux-en-Y gastric bypass, hypertension, and gastroesophageal reflux disease develops transient hypocalcemia after removal of a parathyroid adenoma, incidentally found on postoperative labs. Initial labs show a calcium level of 7.8 mg/dL and albumin 4.0 mg/dL. PTH, phosphorus, and magnesium levels are ordered to determine the etiology of her hypocalcemia. What is the best next step in the management of this patient's hypocalcemia?

## Choices:

1. Oral calcium citrate
2. Wait for additional labs before treatment
3. Oral calcium carbonate
4. Calcium chloride IV

## Answer: 1 - Oral calcium citrate

## Explanations:

- Asymptomatic hypocalcemia above 7.6 mg/dL should be treated with oral supplementation and does not require IV calcium replacement.
- Calcium citrate, although lower in elemental calcium compared to calcium carbonate, is the preferred supplement for patients with low gastric acid state.
- Patients with a low gastric acid state in whom calcium citrate is preferred include patients post gastric bypass and those on chronic proton-pump inhibitors or histamine-2 blockers.
- Hypocalcemia can have deleterious effects if not corrected so waiting for results to determine if the condition is hungry bone syndrome (HBS) or post-surgical hypoparathyroidism is incorrect and puts the patient at risk. The hypocalcemia should be treated immediately without waiting for additional laboratory results.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hungry Bone Syndrome

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## Question 779: A 65-year-old woman presents to the clinic for an appointment to discuss her DEXA (duel energy x-ray absorptiometry) results. The results show her T score is -2.2. Which of the following is the most accurate interpretation of this result?

## Choices:

1. Osteopenia; her result is 2.2 standard deviations less than the gender and race matched average population controls
2. Osteoporosis; her result is 2.2 standard deviations less than the gender and race matched average population controls
3. Osteopenia; her result is 2.2 standard deviations less than the age-matched controls
4. Osteoporosis; her result is 2.2 standard deviations less than the age-matched controls

## Answer: 1 - Osteopenia; her result is 2.2 standard deviations less than the gender and race matched average population controls

## Explanations:

- The World Health Organization (WHO) defines T-scores as greater than or equal to -1.0: normal, less than -1.0 to greater than -2.5: osteopenia, less than or equal to -2.5: osteoporosis, less than or equal to -2.5 plus fragility fracture: severe osteoporosis.
- A T-score is a number of standard deviations between the patient's mean BMD and the mean of the population compared with reference populations matched in gender and race.
- A Z-score is the number of standard deviations above or below the mean of age-matched controls.
- It is appropriate that she is getting a BMD as all women 65 years and older and men 70 years and older should have asymptomatic screening.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Dual Energy X-ray Absorptiometry

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## Question 780:

A 20-year-old woman presents because she is concerned that she may have the same condition as her brother. She has no past medical history and takes no medications. She does not remember the name of the syndrome with which her brother has been recently diagnosed, but she mentions he has type 1 diabetes mellitus and Hashimoto thyroiditis. Which blood test is most likely to find out if she is at risk of this syndrome?

## Choices:

1. Thyroid microsomal antibodies, Islet-cell antibodies, and 21 hydroxylase autoantibodies
2. Thyroid-stimulating hormone level, and liver function tests
3. Hemoglobin A1c level, and 24-hour glucose tolerance test
4. Adrenocorticotropic hormone challenge test, serum cortisol

## Answer: 1 - Thyroid microsomal antibodies, Islet-cell antibodies, and 21 hydroxylase autoantibodies

## Explanations:

- Autoimmune polyendocrine syndrome type 2 is an autoimmune disease that occurs at around age 20 to 40. The presence of anti-thyroglobulin antibodies, thyroid microsomal antibodies, and thyrotropin receptor antibodies (Graves disease) can detect patients at risk of thyroid disease in the future.
- Anti-glutamic acid decarboxylase antibodies (GAD), anti-islet cell antigen 2, and anti-Zn transporter 8 antibodies can detect patients at risk of diabetes mellitus type 1.
- The presence of 21-hydroxylase or 17-hydroxylase autoantibodies can detect patients at risk of autoimmune adrenalitis.
- Family members who are not affected by PAS-2 should watch for symptoms related to adrenal, thyroid, and pancreatic endocrine dysfunction. Asymptomatic carriers should be followed on an annual basis.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Polyglandular Autoimmune Syndrome Type II

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## Question 781:

A 25-year-old woman with a past medical history of hypertension and Bartter syndrome that resulted in end-stage renal disease on hemodialysis is admitted for parathyroidectomy due to uncontrolled secondary hyperparathyroidism. On postoperative day 3, the patient experiences a seizure and sustains a fracture to her left humerus. The patient complains of numbness and tingling in her hands and perioral region. On physical examination, she appears frail and underweight. Vital signs reveal blood pressure 134/72 mmHg, heart rate 77/min, temperature 36.5 C, respiratory rate 12/min, and SpO2 99% on room air. There is visible deformity to her right arm. Facial contraction is noted on the tapping of cheek anterior to the external auditory meatus. Laboratory results show corrected calcium 6.7 mg/dL postoperative day 3, 7.9 mg/dL immediately postoperative and 8.2 mg/dL in preoperative assessment (ref: 8.5-10.2 mg/dL). Phosphorous 1.4 mg/dL postoperative day 3, 3.2 mg/dL immediately postoperative and 4.0 mg/dL in preoperative assessment (ref: 2.3-4.7 mg/dL). Magnesium 1.3 mg/dL postoperative day 3, 1.8 mg/dL immediately postoperative and no result available in preoperative assessment (ref: 1.1-4.2 mg/dL). Parathyroid hormone 45 pg/mL postoperative day 3, 40 pg/mL during intraoperative measurement, 1152 pg/mL in preoperative assessment (ref: 9.0-73 pg/mL). Alkaline phosphatase 300 IU/L on postoperative day 3, 375 IU/L immediately postoperative, and 317 IU/L in preoperative assessment (ref: 40-150 IU/L). What is the most likely cause of the patient's symptomatic hypocalcemia?

## Choices:

1. Shifted increase towards bone formation with osteoblastic activity greater than osteoclastic activity
2. Accidental removal of all parathyroid glands
3. Devascularization of residual parathyroid glands
4. Long-term suppression of nonpathological parathyroid glands

Answer: 1 - Shifted increase towards bone formation with osteoblastic activity greater than osteoclastic activity

## Explanations:

- Hungry bone syndrome (HBS) is believed to be a consequence of the shift of bone metabolism to net bone formation after prolonged stimulation with net resorption.
- The risk factors associated with HBS include elevated parathyroid hormone (PTH) levels, alkaline phosphatase (ALK-P) levels, body mass index (BMI), blood urea nitrogen (BUN), and size of resected glands.
- Evidence of bone diseases such as brown tumors, fractures, and osteitis fibrosa cystica with higher osteoclast numbers on bone biopsy, have also been associated with an increased risk of HBS.
- Accidental removal of all parathyroid glands is an important differential diagnosis in the workup of postoperative hypocalcemia, but the glands would be seen in the pathology specimen. Devascularization of residual glands would behave just as in accidental removal, but the glands would not be found in the removed specimen; rather their blood flow may have been compromised during surgery leading to nonfunctional remaining gland tissue. Parathyroid adenomas in their overactivity can lead to the other parathyroid glands becoming sluggish and underproductive as the adenoma takes over with the excess production of PTH. At times it may be a while before the remaining glands become functional again after the removal of excess PTH source.

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## Research Concepts:

### Hungry Bone Syndrome

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## Question 782:

A 65-year-old female with a history of diabetes presents with a history of intermittent claudication. On examination, she has a 2 X 2 cm ulceration located of her 1st toe which invades the underlying muscles. Which of the following using The University of Texas Diabetic Foot Ulcer Classification System would best assist in making the classification of a 3A wound?

## Choices:

1. A non-ischemic infected wound penetrating to tendon or capsule
2. An ischemic non-infected superficial wound not involving tendon, capsule, or bone
3. An ischemic infected wound penetrating bone or joint
4. Deep ulcer with whole foot gangrene

## Answer: 3 - An ischemic infected wound penetrating bone or joint

## Explanations:

- The University of Texas system grades diabetic foot ulcers by the depth and then stages them by the presence or absence of infection and ischemia.
- Grades have been described as follows: Grade 0 – pre-or postulcerative site that has healed; Grade 1 – superficial wound not involving tendon, capsule, or bone; Grade 2 – wound penetrating to tendon or capsule. Grade 3 – wound penetrating bone or joint.
- And stages as follows: Stage A – clean wounds; Stage B – non-ischemic infected wounds; Stage C – ischemic noninfected wounds; and Stage D – ischemic infected wounds.
- Grade 3 Stage D wounds are the most severe form of the disease and suggest an ischemic infected wound penetrating bone or joint.

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## Research Concepts:

### Diabetic Foot Ulcer

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## Question 783:

A 34-year-old woman presents with abdominal pain, nausea of 2 days duration. She has type 1 diabetes with poorly controlled blood sugars and with HbA1c of 11.4%. Other lab values show elevated AST, ALT, and hyperglycemia. Ultrasound of the liver shows hepatomegaly with uniform echogenicity, possible fatty infiltration. The liver biopsy showed pale and enlarged hepatocytes with prominent cytoplasm on hematoxylin and eosin stain and periodic acid Schiff (PAS) staining after diastase treatment shows "ghost cells." Which of the following strategies will provide a complete resolution of symptoms?

## Choices:

1. Intensive weight loss
2. Low-fat diet
3. An intensive insulin regimen with good glycemic control
4. Regular diet and exercise

## Answer: 3 - An intensive insulin regimen with good glycemic control

## Explanations:

- The liver biopsy shows swollen hepatocytes with glycogen deposition in the cytoplasm, after diastase treatment with PAS staining, the glycogen is digested giving empty or ghost cell appearance.
- With good glycemic control, both clinical and biochemical features of glycogenic hepatopathy (GH) resolve within days to weeks occur.
- Improved glycemic control is the key to the management of glycogenic hepatopathy.
- The patient should be educated to maintain very good glycemic control to prevent the development of glycogenic hepatopathy.

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## Research Concepts:

### Glycogenic Hepatopathy

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## Question 784:

A 28-year-old lady is being evaluated for a three months history of episodic palpitations, which spontaneously resolve after 10-12 minutes. She also reports associated chest pain and diaphoresis and the feeling of impending doom. Medical history is negative for any cardiac disease, but she was diagnosed with neurofibromatosis type 1 (NF-1). There is no family history of cardiac disease, but her younger brother was also diagnosed with NF-1. She is not on any medication. On physical examination, her temperature is 37.1 C, blood pressure is 156/96 mmHg, pulse rate is 110/min, and respiratory rate is 14/min. Heart exam reveals tachycardia, but no murmurs and skin exam shows profuse sweating, and cold and clammy skin. The rest of her examination is within normal limits. Laboratory studies reveal increased urine catecholamines and metanephrines. CT chest, abdomen and pelvis shows a single tumor along the sympathetic chain on the right above the diaphragm. Which of the following findings would be most predictive of poor prognosis in this patient?

## Choices:

1. Size of the tumor on the imaging study
2. Presence of a single tumor in the CT scan
3. Nuclear atypia, pleomorphism, necrosis, mitotic figures, and local/vascular invasion in biopsied lesion
4. Distant metastases of the tumors

## Answer: 4 - Distant metastases of the tumors

## Explanations:

- The patient's presentation is most consistent with a diagnosis of paraganglioma. It is critical to detect all lesions by CT and MRI scans of the entire retroperitoneum rather than the thorax or pelvis to locate the tumor.
- If the CT shows 10 Hounsfield units or less, it suggests lipid-rich mass and hence rules out pheochromocytoma and paraganglioma. If the tumors are still not localized, the next step should be functional imaging.
- Metastasis of tumor to the distant region is associated with poor prognosis and hence, it is the only determinant of worse outcome.
- Size of the tumor does not directly determine the prognosis, but the presence of metastases is the only way to determine the aggressiveness of the tumor and is associated with bad prognosis. Paragangliomas are commonly a single unilateral tumor and multiple tumors are commonly seen more in familial types (20%). Sympathetic cells may have hyaline globules in H&E stain, and giant mitochondria with paracrystalline inclusions may be noticeable on electron microscopy. Nuclear atypia, pleomorphism, necrosis, mitotic figures, and local/vascular invasion is common but not indicative of malignancy. Distant metastasis is the only indicator of malignancy.

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## Research Concepts:

### Paraganglioma

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## Question 785: A 52-year-old menopausal female with a history of uterine fibroids, late-term abortions, hyperlipidemia, and hypertension presents for a lab draw. She has been on oral estrogen therapy for urogenital atrophy for the last year. She is informed that her results are significant only for decreased levels of HDL. Which of the following changes are usually seen in lipids?

## Choices:

1. Increased LDL
2. Increased HDL
3. Decreased triglycerides
4. Increased VLDL

## Answer: 2 - Increased HDL

## Explanations:

- Estrogen therapy generally decreases LDL and increases HDL and triglyceride.
- It also increases bone density and has been shown to lower the incidence of hip fracture.
- It is only indicated for climacteric symptoms, not hyperlipidemia or osteopenia.
- Oral estrogens, especially conjugated estrogens, are often indicated for women who have undergone a hysterectomy.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Estrogen Therapy

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## Question 786:

A 65-year-old male patient is admitted to the hospital with chronic diarrhea and weight loss. He has lost approximately 35 pounds (16 kg) over the past year. On physical examination, he is noted to have a necrolytic migratory erythematous rash on his perioral and perigenital regions. A contrast-enhanced CT scan confirms a 4 cm mass located in the body of the pancreas along with hepatic metastasis. What is the next most appropriate step in his management?

## Choices:

1. Referral to a surgeon for surgical resection
2. Nutritional support with total parenteral nutrition and start on a somatostatin analog
3. Referral to an oncologist for combination chemotherapy
4. Referral to an interventional radiologist for radiofrequency ablation

## Answer: 2 - Nutritional support with total parenteral nutrition and start on a somatostatin analog

## Explanations:

- Initial management of glucagonoma syndrome involves supportive nutritional support with total parenteral nutrition, including supplementation of amino acids and zinc supplementation to reverse the catabolic effects of glucagon.
- Somatostatin analogs like octreotide and lanreotide also help inhibit the secretion of glucagon and reverse the effects of glucagon excess.
- Surgical resection is a curative option in a minority of cases where the tumor is localized to the pancreas.
- Other options, such as radiofrequency ablation, combination chemotherapy, etc. may be helpful in advanced disease but not for initial management.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Glucagonoma Syndrome

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## Question 787:

A 33-year-old female with recently diagnosed type 1 diabetes presents to the office for a follow-up visit. She has brought with her the blood glucose log for the past month. You notice that her pre-breakfast blood glucose has been ranging between 250-350s. She also reports that in spite of taking the insulin as directed and being careful of what she eats; it is very difficult to control her blood glucose in the mornings. The pre-lunch and pre-dinner blood glucose readings have been well controlled. She denies any nocturnal hypoglycemia. How can we control her blood glucose better?

## Choices:

1. Increase the pre-breakfast dose of insulin
2. Increase the pre-lunch dose of Insulin
3. Increase the pre-dinner dose of insulin or basal insulin
4. Decrease the pre-breakfast dose of insulin

## Answer: 3 - Increase the pre-dinner dose of insulin or basal insulin

## Explanations:

- The correct answer is to increase the dose of pre-dinner insulin or basal insulin.
- The patient is experiencing episodes of hyperglycemia in the early morning hours. Physiologically, it is thought to be due to an increase in gluconeogenesis and glycogenolysis in the morning, especially if unopposed by insulin. Normally, hyperglycemia is prevented by a physiologic surge in insulin at the same time.
- In patients with diabetes, aggressive control of glucose should be attempted. An increasing amount of evening exercise and a higher dose of insulin can be helpful.
- Other choices such as 1, 2 and 4 are incorrect options. This phenomenon is also known as the dawn phenomenon.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Human Insulin

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## Question 788:

A 25-year-old man comes to the clinic with a two-week history of frequent urination and extreme thirst. He states he has been drinking tons of water because of an "unquenchable thirst", He complains his sleep is also affected since he has been urinating excessively and drinking water. Previous medical history and physical exam are unremarkable. Lab work reports a serum glucose level of 110 mg/dL (normal range = 70-110 mg/dL), sodium level of 150 mEq/L (normal range = 135-145 mEq/L), serum osmolality of 320 mOsm/kg (normal range = 275-295 mOsm/kg), urine specific gravity of 1.002 (normal range = 1.005-1.030), and urine osmolality of 80 mOsm/kg (normal range = 50-1,400 mOsm/kg), rest of the exams are within normal limits. Based on the suspicion, the clinician decides to administer subcutaneous desmopressin and monitor its response. Which of the following should the clinician expect to occur on urinalysis after its administration?

## Choices:

1. Increase in urine specific gravity or urine osmolality
2. Increase in urinary pH
3. Decrease in urine sodium concentration
4. Decrease in urine specific gravity or urine osmolality

## Answer: 1 - Increase in urine specific gravity or urine osmolality

## Explanations:

- Diabetes insipidus is a disorder characterized by an incapacity from the kidneys to concentrate urine properly. A variety of conditions may cause diabetes insipidus, and they are classified according to four main types: central, nephrogenic, dipsogenic, and gestational.
- Urine specific gravity (USG) is an indirect measure of urine osmolality. It is determined by the weight of all the particles in the solution compared with the weight of an equal volume of distilled water. An increase in specific gravity is associated with dehydration, diarrhea, vomiting, sweating, SIADH (syndrome of inappropriate antidiuretic hormone secretion), and hepatorenal syndrome.
- Decreased specific gravity occurs in renal failure, diabetes insipidus, diuretic use, acute tubular necrosis, adrenal insufficiency, and interstitial nephritis.
- Depending on the reference, urine specific gravity normally ranges from 1.005-1.030.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Urinalysis

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## Question 789: A 70-year-old man with a past medical history of coronary artery disease, atrial fibrillation, hypertension, and hyperlipidemia presents to the office for a follow-up visit. He was recently diagnosed with type 2 diabetes mellitus. His HbA1c is 8.1% despite taking metformin for the past three months. His other medications include rosuvastatin, metoprolol, apixaban, and a multivitamin. His BMI is 31 $kg/m^2$. Which of the following is the next best step in the management of this patient?

## Choices:

1. Glimepiride
2. Semaglutide
3. Exenatide
4. Acarbose

## Answer: 2 - Semaglutide

## Explanations:

- Clinical trials for cardiovascular outcomes have shown that the GLP-1 receptor agonists semaglutide, liraglutide and dulaglutide reduce the risk of major adverse cardiovascular events in patients with established cardiovascular disease.
- Short-acting agents like exenatide have not shown a cardiovascular benefit.
- Glimepiride does not have a proven risk reduction of cardiovascular disease. It also has the added side effect of weight gain, and semaglutide can cause weight loss, which would be helpful in this patient.
- According to the ACE trial, acarbose, an alpha-glucosidase inhibitor, does not reduce the risk of cardiovascular events.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Compare And Contrast the Glucagon-like Peptide-1 Receptor Agonists (GLP1RAs)

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## Question 790:

A 65-year-old female with a past medical history significant for schizophrenia, diabetes mellitus type 2, hypertension, alcohol use disorder, and smoking presents to the emergency department with her husband with a 2-3 week history of nonspecific symptoms of nausea, difficulty with speech, difficulty with gait, and generalized weakness. She takes losartan, olanzapine, and metformin. Physical examination reveals that she is not fully oriented to the situation and time. Her husband says that she has gotten more confused in the last two months or so and has been urinating frequently. The patient and her husband deny dysuria and fever. A computed tomography (CT) scan of the head is done and is unremarkable. Initial labs reveal hemoglobin 11 g/dL, platelets 92000/microL, white blood cell count 4000/microL, hemoglobin A1c 6.8%, and sodium 121 mEq/L. The patient follows up with her psychiatrist regularly and has been taking olanzapine for 11 years. While in the emergency department, she keeps asking for more and more water and has frequent urination. Urinalysis reveals no white cells, negative for leukocyte esterase, and negative for nitrites, and has a urine osmolality of 234 mOsm/L. What is the next best step in the management of this patient?

## Choices:

1. Hypertonic saline
2. Water deprivation test
3. Serum copeptin level
4. Urine output measurement

## Answer: 4 - Urine output measurement

## Explanations:

- If hypotonic polyuria is present with urine excretion of more than 40-50 mL/kg/day, urine osmolality less than 800 mOsm/L, and serum sodium of less than 135 mEq/L then a diagnosis of primary polydipsia is made.
- This can be explained by the fact that the excretory capacity of the kidney is overwhelmed, and the serum gets very diluted. In diabetes insipidus, it is not the case since serum sodium level in these patients does not go below 135 mEq/L.
- This is due to no availability of vasopressin or resistance to vasopressin leading to polyuria rather than excess water intake. Patients can be hypernatremic or have a normal sodium level in diabetes insipidus as the body loses free water.
- The most appropriate next step is to quantify the amount of excreted urine in 24 hours. At this stage and with the given information, primary polydipsia is not evident since the patient has not yet met the criteria for polyuria. It should be established that the patient has hypotonic polyuria with urine produced more than 40-50 mL/kg/day, urine osmolality less than 800 mOsm/L, and sodium level to be in between 136-146 mEq/L before proceeding to measure the copeptin level. A copeptin level of more than 21.4 pmol/L establishes the diagnosis of nephrogenic diabetes insipidus. The next step to differentiate between psychogenic polydipsia and central diabetes insipidus is doing the water deprivation test or hypertonic saline infusion (aim to increase serum sodium level to 150 mmol/L and above) to stimulate the secretion of vasopressin. After the stimulation, if the copeptin level increases by more than 4.9 pmol/L, it is diagnostic of primary polydipsia. If the increase is less than 4.9 pmol/L, it is diagnostic of central diabetes insipidus.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Primary Polydipsia

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## Question 791:

A 36-year-old man presents to the clinic for an annual check-up. He initially weighed 110 kilograms and had lost 29 kilograms 3 years ago after a strict calorie intake and exercise regime. He reports weight regain even after persistent trying through calorie modulation and limited exercise. His blood pressure is 132/86 mmHg. He had hypertension before his weight loss, and a reduction in weight had initially normalized his blood pressure. A reduced concentration of which of the following hormones is most likely responsible for the patient's weight regain?

## Choices:

1. Leptin
2. Glucagon
3. Insulin
4. Antidiuretic hormone

## Answer: 1 - Leptin

## Explanations:

- Plasma leptin levels drop with a reduction in fat mass during weight loss. Overweight subjects who lost about 20% of their fat mass, an average drop of 50% leptin levels is usually observed.
- Decreased plasm leptin concentrations lead to leptin deficiency in the brain, enhancing the risk for higher energy intake during the after-weight-loss period, and hence weight regain.
- Drop is plasma leptin is a marker for weight loss irrespective of the type of weight regime followed. Research has indicated that leptin may serve as a pinpointed hormonal target associated with weight gain after a healthy weight loss.
- Leptin injected during the weight maintenance period induced a reversal of the activities in those regions of the brain that are typical for enhanced energy intake regulation. Administration of leptin or similar drugs tends to restrict the negative physiologic effects of weight loss towards healthy weight maintenance.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Metabolic Consequences Of Weight Reduction

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## Question 792:

A 58-year-old woman is evaluated in the emergency department for significant fatigue, and difficulty standing up. She had a fall from her bed because of dizziness. Her history is significant for stage 4 triple-negative, PD-L1 positive breast cancer with metastasis diagnosed five months ago. She is currently on atezolizumab, a checkpoint inhibitor, and chemotherapy. She just completed her fourth cycle two weeks ago and reported mild nausea and vomiting during sessions that are controlled with paracetamol and ondansetron. The patient also has a history of asthma, which is managed with a daily salbutamol inhaler. Last week, she and her husband were afflicted with two days of a ‘stomach bug’ with self-resolving diarrhea and mild abdominal pain. She does not have any abdominal pain or respiratory distress now. Her vital signs are within normal range; however, she gets dizzy while standing up from sitting position. Lab workup today reveals a normal complete blood count with serum sodium 131 mEq/L, potassium 3.2 mEq/L, glucose 75 mEq/L, ACTH 8 pg/mL, morning cortisol 2 microgram/dL. Which of the following is the most likely triggering event?

## Choices:

1. Checkpoint therapy
2. Gastroenteritis
3. Chronic adrenal insufficiency
4. Acute adrenal hemorrhage

## Answer: 1 - Checkpoint therapy

## Explanations:

- Immunotherapy with checkpoint therapy, such as atezolizumab for breast cancer, is associated with acquired endocrinopathies such as adrenal insufficiency due to causing hypophysitis, the autoimmune destruction of the pituitary.
- Checkpoint therapy for lung, breast, and melanoma cancers may precipitate an adrenal crisis. Some other complications include thyroiditis and type 1 diabetes.
- The average onset of endocrine-related complications from checkpoint therapy may occur from 6 to 12 weeks after starting therapy.
- The patient's symptoms and electrolytes are concerning for acute adrenal insufficiency. Her ACTH and cortisol levels are low, suggesting secondary adrenal insufficiency from hypopituitarism.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Addisonian Crisis

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## Question 793:

A 59-year-old woman presents to the clinic with concerns of hand and feet swelling along with coarsening of facial features. She is noted to have a prominent supraorbital ridge, broad nose, acne, large lips, overbite, prognathism, tongue enlargement, and coarsening of facial features on clinical examination. Her fasting blood glucose level is 140 mg/dL. An IGF-1 level is obtained, which is high at 504 ng/mL (reference range: 117-321 ng/mL). She is being planned for medical treatment as she is surgically not fit. She is prescribed a second-generation somatostatin analog. Two weeks later, she presents to the clinic with a fasting blood glucose of 200 mg/dL. Which of the following best describes the mechanism responsible for this patient's increased blood glucose?

## Choices:

1. Binding to somatostatin receptor 3 (SSTR3) leading to the suppression of insulin secretion
2. Binding to somatostatin receptor 5 (SSTR5) leading to an increase in glucagon secretion
3. Binding to somatostatin receptor 5 (SSTR5) leading to the suppression of insulin secretion
4. Binding to somatostatin receptor 3 (SSTR3) leading to an increase in glucagon secretion

## Answer: 3 - Binding to somatostatin receptor 5 (SSTR5) leading to the suppression of insulin secretion

## Explanations:

- The patient in the clinical vignette most likely has acromegaly.
- Pasireotide is a second-generation somatostatin analog used in the treatment of acromegaly.
- Pasireotide preferentially binds to somatostatin receptor 5 and causes a suppression of insulin secretion.
- Pasireotide has little impact on glucagon secretion.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Gigantism And Acromegaly

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## Question 794:

A 35-year-old man with a history of class 3 obesity presents to the clinic for evaluation. A surgical procedure is recommended that involves laparoscopic resection of 80% of the greater curvature of the stomach as one of the options. Which of the following metabolic abnormalities is most likely to occur as a result of this procedure?

## Choices:

1. Vitamin B12 deficiency
2. Hypercholesterolemia
3. Hyperglycemia
4. Polycythemia

## Answer: 1 - Vitamin B12 deficiency

## Explanations:

- Sleeve gastrectomy involving resection of 80% of the greater curvature of the stomach can make the patients prone to vitamin B12 deficiency.
- Resection of a significant part of the stomach removes many gastric parietal cells. This decreases the production of intrinsic factor and ghrelin.
- Vitamin B12 absorption in the intestinal tract is greatly reduced without the intrinsic factor, and thus patients with sleeve gastrectomy become prone to vitamin B12 deficiency.
- Sleeve gastrectomy is the most common bariatric surgery performed worldwide and reduces weight-related health problems, including high cholesterol, diabetes, heart diseases, and stroke.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Obesity Surgery Pre-Op Assessment And Preparation

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## Question 795: A 50-year-old male patient with three children presents to the clinic with complaints of progressive bilateral enlargement of the breasts over 6 months. Physical examination of the head, neck, and chest does not reveal any significant abnormality. Upon further inquiry, the patient states that he is not on any medications and does not use recreational drugs. Laboratory tests done reveal that both LH and testosterone are low. Which of the following is the most appropriate diagnostic test?

## Choices:

1. Breast biopsy
2. Karyotype to check for Klinefelter syndrome
3. Measurement of human chorionic gonadotropin and estradiol
4. Liver function tests

## Answer: 3 - Measurement of human chorionic gonadotropin and estradiol

## Explanations:

- The patient in this scenario is most likely suffering from gynecomastia. The patient's low testosterone and LH suggest either HCG or estrogen production which can come from lung cancer or germ cell tumors.
- Gynecomastia develops when the testosterone to estrogen ratio decreases.
- Tumors of the adrenal glands, pituitary, lungs, and testes can impact hormonal changes resulting in imbalances and ultimately gynecomastia. Medications that have been shown to contribute to this condition include digoxin, thiazides, estrogens, phenothiazines, and theophylline. The use of certain recreational drugs including marijuana has also been associated with this disease.
- Bilateral gynecomastia makes breast malignancy unlikely so a biopsy is not needed. Given the patient has 3 children, the diagnosis of Klinefelter's is highly unlikely.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Gynecomastia

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## Question 796:

A 31-year-old female patient presents to the clinic with a 6-month history of abnormal and missed periods, loss of libido, and decreased body hair. She has a past medical history of hypertension and diabetes. Her blood pressure is 138/80 mmHg, pulse 76/min, respirations 16/min, temperature 98.0 F (36.7 C). On physical examination, galactorrhea is present. The patient has decreased axillary and pubic hair. Laboratory results show thyroid-stimulating hormone (TSH) 9.4 IU/mL (0.27-4.20), beta-hCG undetectable, and prolactin 175 ng/mL (3.4-24.1). What is the most likely cause of the patient's hyperprolactinemia?

## Choices:

1. Secondary hypothyroidism
2. Medication side effect
3. Primary hypothyroidism
4. Prolactinoma

## Answer: 3 - Primary hypothyroidism

## Explanations:

- This patient has an elevated TSH accompanied by an elevated prolactin level and an undetectable beta-hCG. These results suggest primary hypothyroidism. In primary hypothyroidism, low thyroid hormone levels elevate TSH and TRH through negative feedback. The elevation in thyrotropin-releasing hormone (TRH) causes prolactin levels to rise.
- Medications known to elevate prolactin include dopamine antagonists, mainly risperidone and typical (first generation) antipsychotics. If hyperprolactinemia is suspected because of a medication, it should be discontinued temporarily, if possible, to see if prolactin level normalizes. If medication cannot be discontinued, especially antipsychotics, it should be changed to a different antipsychotic that does not increase prolactin, e.g., quetiapine. If that is not possible, the addition of a dopamine agonist should be considered. These changes should be made in consultation with a psychiatrist. The addition of estradiol in women and testosterone in men can be considered for hypogonadism and low bone mass. If the prolactin level does not normalize after stopping medications or if discontinuation of medications is not possible, pituitary MRI should be done.
- Patients with primary hypothyroidism experience low thyroid hormone levels, which causes an elevation of TSH and TRH through negative feedback. The elevation in TRH causes prolactin levels to rise. Secondary hypothyroidism is rare and due to an underactive pituitary, releasing lower levels of TSH and therefore resulting in lower thyroid hormone and is not associated with hyperprolactinemia.
- Prolactinoma is a benign tumor of lactotrophs. It accounts for up to 40% of all pituitary adenomas. It can present with any level of prolactin elevation from mild elevation to 50,000 ng/ml. In contrast, prolactin elevation from other causes rarely exceeds 200 ng/ml. Prolactinomas are identified on MRI and can be associated with headaches or visual changes due to mass effects.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hyperprolactinemia

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## Question 797:

A 57-year-old male comes to the office for an annual appointment. He has a history of hypertension, for which he takes lisinopril 5 mg tablet daily. Upon questioning, he says he experiences redness on his face, difficulty in breathing, and feels gasping for air when he places shoeboxes with both hands to the top shelf in the store, but denies pain. His blood pressure is 153/96 mmHg, pulse 84/min, the temperature is afebrile, and respirations are 19/min. Neck examination shows bilaterally enlarged thyroid gland more on the right lobe than left with an indistinct lower border. Lungs are clear to auscultation. The cardiovascular exam shows palpable peripheral pulses, normal S1, loud S2, and II/VI mid-systolic murmur audible at the aortic area. What is the most likely physiology underlying the patient's complaint?

## Choices:

1. Enlarged thyroid obstructing venous outflow from the head and neck
2. Presence of a cervical rib obstructing venous outflow from the head and neck
3. Portal hypertension causing increased venous pressure is the superior vena cava
4. Vasospasm in the extremities causing increased venous pressure

## Answer: 1 - Enlarged thyroid obstructing venous outflow from the head and neck

## Explanations:

- The patient has a goiter, and the lower border of the thyroid is not palpable. He has facial flushing due to impairment of venous return and difficulty in breathing when he raises his hand above his head during work. This phenomenon is known as Pemberton's sign. Pemberton's sign is positive when the patient raises both arms until medial parts touch to the head for at least a minute, after which the patient starts to develop facial congestion, bulging of neck veins, hoarseness, or dyspnea.
- Dyspnea in substernal goiter and Pemberton's sign is due to upper airway obstruction and is evident during inspiration. Patients with substernal goiter can have stridor.
- The patient developed a high-pitched breathing sound in inspiration, consistent with stridor. Pemberton sign indicates compression at the thoracic inlet due to substernal goiter.
- Thoracic outlet syndrome can be similar clinically to a Pemberton's sign but will include pain in the fingers. Portal hypertension may result in jugular venous distention but will likely lack the association with arm elevation. Vasospasm in the extremities is thought to be the underlying pathophysiology of Raynaud's phenomenon and is inconsistent with the question stem.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Substernal Goiter

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## Question 798:

A 30-year-old woman who was recently diagnosed as a case of primary antiphospholipid syndrome, after an episode unprovoked bilateral deep venous thrombosis last month, is brought to the emergency room with complaints of left flank pain. She was recently started on oral warfarin for DVT treatment. She has been compliant with drug therapy and reports no adverse effects. The current episode of dull flank pain started 1 day back, is non-radiating, and is associated with nausea. She reports no urinary complaints and has not experienced previous similar symptoms. She reports feeling dizzy for the last 12 hours, which brought her to the hospital. A provisional diagnosis of renal colic is made, and she is referred for a CT scan abdomen. The scan reveals no renal stones; however, both the adrenal gland showed enlargement along with increased attenuation. What is the most likely etiology for the CT finding?

## Choices:

1. Auto-immune inflammation in adrenal gland
2. Infiltration of the gland by non-caseating granulomas
3. Adrenal vein thrombosis
4. Metastatic deposit in the gland

## Answer: 3 - Adrenal vein thrombosis

## Explanations:

- Antiphospholipid syndrome is associated with antibodies directed against membrane phospholipids, usually anticardiolipin or lupus anticoagulant. This predisposes to endothelial dysfunction and a hypercoagulable state with arterial and venous thrombosis. Treatment with oral anticoagulants is often required. This patient recently was started on oral warfarin for her deep venous thrombosis and, has subsequently developed adrenal hemorrhage.
- The adrenal gland is a highly vascular organ with rich arterial supply. Branches of the inferior phrenic, aorta and renal arteries provide the main arterial supply. In comparison, there are limited channels for venous drainage, usually through a single adrenal vein. In periods of increased vascular flow, e.g., stress, the venous drainage ability may be overwhelmed and may contribute to the pathophysiology of adrenal hemorrhage. Several other factors, such as vasospasm from the high concentration of catecholamines in the adrenal vein have also been implicated.
- Hypercoagulable states like antiphospholipid syndrome are an important cause of adrenal hemorrhage, which may present as nonspecific symptoms or as acute adrenal insufficiency. CT scan reveals enlarged glands with increased attenuation reflecting the acute nature of the event. There is peri-adrenal fat stranding secondary to the inflammatory change. Diagnosis can be further made by testing of serum cortisol and ACTH levels, low cortisol with high ACTH confirms the clinical suspicion.
- While autoimmune adrenalitis is the most common cause of adrenal insufficiency in the developed countries, adrenal hemorrhage is more common than autoimmune destruction in patients with Antiphospholipid syndrome. Gland enlargement can occur due to infiltration with non-caseating granulomas as in sarcoidosis or metastatic deposits, both of which are unlikely in this patient.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Adrenal Hemorrhage

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## Question 799: A 40-year-old woman comes to the outpatient clinics with a one-month history of palpitation, weight loss, feeling hot and sweating. The patient is not on any medication The patient has no significant past medical and past-surgical history. Family history reveals that her mother has SLE. On physical examination, his HR was 120beats/min and the Temp was 99F and the thyroid gland is normal size. The thyroid function test revealed TSH levels of 0.2 milli-international unit per liter and T4 levels of 15ug/dl. A thyroid uptake scan is performed which shows a small area in the thyroid gland with an increased uptake of radioactive tracer. What is the next step in the management of this patient?

## Choices:

1. Excision of the nodule
2. Methimazole
3. Fine needle aspiration biopsy
4. Radioactive Iodine

## Answer: 2 - Methimazole

## Explanations:

- Thyroid adenoma presents as a hot thyroid nodule over the thyroid uptake scan showing increased uptake of the radioactive tracer.
- The patient usually presents with the symptoms of hyperthyroidism. Symptomatic control is started upon the diagnosis of hyperthyroidism.
- Anti-thyroid medications are started upon the diagnosis of hyperthyroidism while the patient is prepared for either the removal of the nodule or treatment through radioactive iodine. The patient must be euthyroid before the surgery to decrease the complications of thyroid surgery.
- Fine needle aspiration is not required as the high uptake nodule presenting with hyperthyroidism is usually benign.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Thyroid Nodule

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## Question 800: A young female presents with fatigue, acne, weight gain, and amenorrhea. She has gained 25 pounds (11 kg) over the past 6 months. She has been amenorrheic for 4 months and multiple pregnancy tests have been negative. She has striae at both flanks, a moon face, and a buffalo hump. What initial test should be done to make the diagnosis?

## Choices:

1. A corticotropin-releasing hormone (CRH) level at 8 o'clock in the morning
2. An overnight 1 mg dexamethasone suppression test
3. A random urine free cortisol
4. A 12-hour 1 mg dexamethasone suppression test

## Answer: 2 - An overnight 1 mg dexamethasone suppression test

## Explanations:

- A 24-hour urine free cortisol level higher than three times the upper limit of normal is highly suggestive of Cushing syndrome.
- An overnight 1 mg dexamethasone suppression test is done by administering 1 mg of dexamethasone at 11 o'clock at night and measuring the cortisol level at 8 o'clock the next morning.
- An elevated serum cortisol level at 11 o'clock at night can be an early finding in patients with Cushing syndrome.
- The dexamethasone-CRH (corticotropin-releasing hormone) test is used to differentiate a patient with Cushing syndrome from one with pseudo-Cushing states.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Cushing Syndrome

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## Section 9

Question 801: A 65-year-old woman with a history of hyperparathydoidism and obesity is being evaluated on postoperative day 1 after parathyroidectomy. The surgery was difficult because of the short neck and dense adhesions from prior radiation therapy. During the night, the patient complains of tingling sensations around the lips. Tapping the facial nerve causes perioral muscle twitching. Which of the following conditions is also most likely cause the elicited response?

### Choices:

1. Hyperthyroidism
2. Measles
3. Mumps
4. Tuberculosis

## Answer: 2 - Measles

## Explanations:

- Chvostek sign is an indication of hypocalcemia. Almost any disorder that causes hypocalcemia will reveal a positive Chvostek sign.
- However, the Chvostek sign may be positive in diphtheria, rickets, measles and scarlet fever.
- Chvostek sign also may be seen in children with whooping cough and myxedema.
- The sign elicited is the Chvostek sign, which is generally caused by electrolyte abnormalities or infections. Measles is a known cause. TB is a bacterial infection that mainly infects the lungs, not facial nerves.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Chvostek Sign

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## Question 802:

A 27-year-old woman presents with breast heaviness and absent menses for the past eight months. She also reveals she has been depressed and had headaches that she attributes to stress. On examination, confrontational testing reveals defects in her peripheral vision. After confirmation of the diagnosis, she is started on medical therapy. Two months later, she returns and reports that her menses have resumed, and her breast size has slightly reduced. For how long should the prescribed medication be continued?

## Choices:

1. The medication should be continued for life
2. The medication can be safely weaned at 1 year
3. The medication could be discontinued after 2 years, but prolactin levels and adenoma size should be monitored
4. The medication can be discontinued after menopause, as long as there are no visual symptoms

## Answer: 3 - The medication could be discontinued after 2 years, but prolactin levels and adenoma size should be monitored

## Explanations:

- Discontinuation of cabergoline can be considered in those patients who had macroadenomas of modest size (1 to 1.5 cm), whose serum prolactin concentrations have been normal for more than 2 years, and whose adenomas can no longer be visualized by MRI.
- Prolactin levels should then be followed, and if there is elevation, an MRI should be done.
- Discontinuation of cabergoline should probably not be considered if the adenoma was initially more than 2 cm, if it can still be visualized by MRI during treatment, or if the prolactin level has not become normal during treatment.
- Even after menopause, the adenoma may recur.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Prolactinoma

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## Question 803:

A 25-year-old woman presents to the clinic for increasing fatigue. She was diagnosed with Plummer disease (toxic multinodular goiter) 4 months ago. Radioactive iodine was administered to treat her thyrotoxicosis about 7 weeks ago. Her tremors and palpitations have improved. She has gained 5 lbs in the last 5 weeks, and she is complaining of cold intolerance. Her blood pressure is 128/80 mmHg with pulse 78/min. Examination reveals mild diffuse thyromegaly without bruits or nodules. There is no proptosis, tremor, or pretibial myxedema. Her serum TSH level is 0.05 mIU/L. Which of the following is the next best step in the management of this patient?

## Choices:

1. Radioactive iodine uptake and scan
2. Repeat TSH in 4 weeks
3. Serum T3 and T4 levels
4. Prescribe levothyroxine

## Answer: 3 - Serum T3 and T4 levels

## Explanations:

- The majority of patients receiving radioactive iodine therapy show improvement in 4-8 weeks. Up to 80% of patients develop hypothyroidism between 2-6 months following treatment.
- Sometimes, hypothyroidism post-treatment can be transient and self-limited. TSH may be suppressed for months after hyperthyroidism is resolved.
- The most appropriate next step is to obtain T3 and T4 levels, and if the levels are low, the patient should be prescribed levothyroxine. If the levels are normal, the patient should be reassessed again in 4-8 weeks.
- Radioactive iodine uptake scan is helpful in Graves and TMNG, but it is not helpful for monitoring in the post radioactive iodine period. We shouldn't prescribe levothyroxine without checking the T3 and T4 levels as hypothyroidism post-treatment can be transient and self-limited.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Plummer Disease

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## Question 804: A 65-year-old female who has been taking simvastatin for six months presents with an LDL-C level of 241 mg/dL and an HDL-C level of 35 mg/dL. The clinician prescribes a new medication to be taken along with simvastatin. The patient returns three months later, and her LDL-C is 190 mg/dL, and HDL-C is 34 mg/dL. Which of the following medications was most likely prescribed?

## Choices:

1. Gemfibrozil
2. Niacin
3. Fenofibrate
4. Ezetimibe

## Answer: 4 - Ezetimibe

## Explanations:

- This patient has high LDL-C levels and low HDL-C levels initially, despite taking simvastatin. After three months of treatment, her LDL-C level is significantly lower, but her HDL-C is relatively unchanged.
- Cholesterol absorption inhibitors, like ezetimibe, are a next-line drug given their safety in combination with statins.
- Ezetimibe does not significantly affect HDL levels, making it the most likely newly prescribed medication.
- Gemfibrozil, niacin, and fenofibrate can increase HDL-C levels, making them less likely to be the newly prescribed medication.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hypercholesterolemia

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## Question 805:

A 35-year-old man presents to the clinic with a recent history of excess urination and thirst. He has no other complaints. He has no other medical history. His vital signs include a temperature of 98.1 F, a blood pressure of 122/73 mmHg, a respiratory rate of 17/min, and a heart rate of 85/min. The clinician performs an HbA1c, which is found to be elevated at 8.8%. He is told that he will need routine ophthalmologic evaluations. Which of the following ocular findings is most likely to be found in this patient?

## Choices:

1. Flame hemorrhages
2. Cotton-wool spots
3. Accumulation of lipids in Bruch's membrane
4. Elevated intraocular pressures

## Answer: 2 - Cotton-wool spots

## Explanations:

- This patient likely has type 2 diabetes mellitus given his hemoglobin A1c and clinical history.
- Diabetes is a systemic small vessel disease that affects various small vessels in the body.
- Diabetes can lead to cotton wool hemorrhages in the retina.
- Flame hemorrhages are seen in hypertension. Lipid in Bruch's membrane is seen with dry macular degeneration. Elevated intraocular pressures can be seen with glaucoma.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Diabetic Macular Edema

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## Question 806: A 27-year-old pregnant insulin-dependent patient with diabetes mellitus with microalbuminuria has in the past had photo laser ablation for retinopathy. She may be at risk for which of the following?

## Choices:

1. Neuropathy
2. Gastroparesis
3. Nephropathy
4. Proliferative retinopathy

## Answer: 4 - Proliferative retinopathy

## Explanations:

- Benign retinopathy does not worsen with pregnancy.
- Pregnancy has not been found to exacerbate or modify diabetic nephropathy and diabetic neuropathy. Gastroparesis may complicate some pregnancies, but pregnancy does not affect the overall disease process.
- The incidence of renal failure is almost 30% in patients with type 1 diabetes mellitus and 4-20% in patients with type 2 diabetes mellitus.
- Proliferative retinopathy is the one diabetic complication that pregnancy is thought to worsen.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Diabetic Retinopathy

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## Question 807:

A 16-year-old male patient with bipolar disorder was started on lithium for his increasing manic episodes a few months ago. Now he presents with fatigue, lethargy, generalized weakness, and right-sided lumbar pain for two weeks. On examination, blood pressure 140/80 mmHg, pulse 96/min regular, respiratory rate 24/min, and oxygen saturation 96% on room air. His serum anion gap is normal. His arterial blood gas shows pH 7.09, $HCO_3$ 14 mEq/L, and $pCO_2$ 37 mmHg. The urine anion gap is 45 mEq/L. Which of the following would be most beneficial in treating the underlying pathology?

## Choices:

1. Sodium citrate
2. Sodium bicarbonate
3. Potassium citrate
4. Hydrochlorothiazide

## Answer: 2 - Sodium bicarbonate

## Explanations:

- Hyperchloremic acidosis is a normal anion gap, metabolic acidosis. In this case, it is being caused by distal renal tubular acidosis secondary to the use of lithium.
- Also, there is a decrease in plasma bicarbonate concentration and an increase in plasma chloride concentration.
- The urine anion gap provides an estimate of urinary ammonium (NH4) excretion. The normal renal response to metabolic acidosis is to increase acidic NH4 excretion. Therefore, a positive urine anion gap between 20 and 90 mEq/L is indicative of low or normal NH4 excretion, such as is seen in distal renal tubular acidosis.
- Treatment with sodium bicarbonate has many beneficial effects. It helps in the restoration of growth in children, it reduces nephrolithiasis (which is the case here), and it prevents inappropriate potassium and calcium losses.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hyperchloremic Acidosis

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## Question 808:

A 70-year-old is being evaluated for persistently elevated serum parathyroid hormone (PTH) with corresponding normal serum ionized calcium (iCa). Three sets of tests were done on 3 different days, and all showed the same pattern. She has no complaints, no significant past medical history, and no surgeries or fractures. She had natural menopause at age 51. She does not use tobacco, alcohol, or recreational drugs. She does not take any medications. She is physically and socially active and takes an active part in the activities of her local church. A review of systems is non-contributory. Physical examination reveals a pleasant woman in no apparent distress. Vital signs, cardiovascular, respiratory, abdominal, neurological, musculoskeletal, and breast examinations are all normal. Her 25 hydroxyvitamin D is 41 ng/mL, estimated glomerular filtration rate (eGFR) is 85 mL/mim/1.73 m2, while complete hemogram, urinary calcium excretion, and liver function tests are normal. Her DEXA scan reveals a T score of -1.8 at the lumbar spine, -1.6 at the hips, and-1.4 at the distal radius. Renal ultrasound shows no nephrolithiasis or nephrocalcinosis. What is the next best step in the evaluation of this patient?

## Choices:

1. Ultrasound of the neck
2. Sestamibi scan of the neck
3. Dual tracer Tc 99m /123-I scan of the neck
4. No further testing

## Answer: 4 - No further testing

## Explanations:

- With consistently normal ionized calcium and elevated PTH, this patient has normocalcemic primary hyperparathyroidism (nPHPT). With normal renal function, normal 25 hydroxyvitamin D levels, no medications that could affect PTH, no hypercalciuria, and no evidence for malabsorptive states, normocalcemic secondary hyperparathyroidism (nSHPT) is ruled out. It is mandatory to exclude nSHPT before embarking on a diagnosis of nPHPT carefully.
- According to the expert panel on asymptomatic primary hyperparathyroidism, parathyroidectomy (PTX) is recommended for PHPT patients with osteoporosis (T score of -2.5 or more), fragility fractures, nephrolithiasis, nephrocalcinosis, a decline in renal function to less than 60 ml/min/1.73 m2 of estimated glomerular filtration rate (eGFR), or a rise of serum calcium by 1 mg from baseline.
- The diagnosis of nPHPT is biochemical. Ultrasound and all nuclear scans are localizing procedures before PTX and have no role in the diagnosis of nPHPT. They are not indicated in this patient at this time, as she does not meet surgical criteria and does not need PTX at this time.
- This patient needs a regular yearly follow-up with serum ionized calcium, PTH, eGFR, and DEXA scans to monitor her for deterioration. If she deteriorates and meets surgical criteria, PTX can improve her condition. PTX has been shown in studies to improve bone mineral density in nPHPT, just as in classical hypercalcemic PHPT. Although elective PTX may be offered to hypercalcemic PHPT patients not meeting surgical criteria, the jury is not out in nPHPT.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Normocalcemic Hyperparathyroidism

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## Question 809:

A 65-year-old lady presents to the emergency department with complaints of nausea, vomiting, and anorexia. She is a known case of breast carcinoma and was given chemotherapy with paclitaxel and doxorubicin about one week back. Her laboratory investigations one week back were all normal. Now her hemoglobin is 10.5 mg/dl, the white cell count is 3500 cells/MCL, serum uric acid is 14 mg/dl, serum potassium 6.5 mEq/L, phosphate 12 mg/dl, creatinine 2.6 mg/dl and blood urea nitrogen of 86 mg/dl. What is the most appropriate step in her management?

## Choices:

1. IV hydration
2. IV antibiotics
3. Repeat chemotherapy
4. Blood transfusion

## Answer: 1 - IV hydration

## Explanations:

- Tumor lysis syndrome (TLS) is characterized by hyperuricemia, hyperkalemia, hyperphosphatemia, and hypocalcemia. It can be a complication while treating malignancies.
- Clinicians should be aware of the clinical signs and laboratory parameters of TLS. It is an oncologic emergency that is caused by massive tumor cell lysis.
- Management consists of aggressive IV hydration prophylactically and the use of hypouricemic agents such as allopurinol and rasburicase. Hypocalcemia, not hypercalcemia is a feature of TLS.
- If a patient progresses to TLS despite prophylactic measures, then treatment consists of correcting the underlying electrolyte abnormalities and management of the patient's symptoms.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Tumor Lysis Syndrome

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## Question 810:

A 35-year-old African American female is brought to the emergency department with nausea and confusion. Her family reports that she has been drinking and urinating much more than usual. Physical exam shows dry mucous membranes and orthostasis. Glucose is 85 mg/dL. ECG shows bradycardia and shortened QT interval. She has also developed new neurologic deficits. Which part of the spinal cord is most likely affected in this patient?

## Choices:

1. The spinal cord would not be affected
2. Cervical spinal cord
3. Thoracic spinal cord
4. Lumbosacral spinal cord

## Answer: 2 - Cervical spinal cord

## Explanations:

- Sarcoidosis mimics a plethora of other diseases and should always be considered in a differential. Diabetes insipidus is a rare complication of sarcoidosis. There is infiltration of the hypothalamic-pituitary region.
- Although the cervical spinal cord is most commonly affected, sarcoid can involve the nervous system at any level.
- Sarcoid involvement is primarily intramedullary in the spinal cord
- Sarcoidosis is a multisystem disorder of unknown etiology that mostly affects young adults worldwide and presents with noncaseating granulomas in various organs. Characteristically it presents with bilateral hilar lymphadenopathy and reticular opacities in the lungs. Other major involved sites include skin, eyes, and joints. However, it can express to a variable degree in the musculoskeletal system, reticuloendothelial system, exocrine glands, heart, kidney, and central nervous system.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Sarcoidosis

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## Question 811:

A 40-year-old man presents to the clinician with a 3-month history of non-bloody, nonmucoid, non-oily watery diarrhea. He has a murmur, which gets louder with inspiration and is best heard over the left lower sternal border. His face is warm and appears to be engorged with blood for many minutes during the examination. His laboratory studies show vanillylmandelic acid 6 mg/day (normal 0-7 mg/day), urine metanephrine 249 mcg/g of creatinine (normal 0-300 µg/g), urine homovanillic acid 14 mg/day (normal 0-15 mg/day), 5-HIAA 28 mg/day (normal 0-9 mg/day). Gastrointestinal endoscopy is most likely to show a lesion located near which of the following?

## Choices:

1. Gastroesophageal junction
2. Ligament of Treitz
3. Rectosigmoid junction
4. Splenic flexure

## Answer: 2 - Ligament of Treitz

## Explanations:

- The patient most likely has carcinoid syndrome. This patient's chronic diarrhea, intermittent facial flushing, and a murmur consistent with tricuspid stenosis, a triad of findings classic for carcinoid syndrome. 1/3rd of carcinoid tumors of the GI tract happens in the small bowel, which begins at the ligament of Treitz and ends at the mid-transverse colon. Carcinoid tumor most likely occurs in the small bowel.
- Carcinoid tumors of the small intestine secrete serotonin that usually is metabolized by the liver and does not cause the symptoms of the carcinoid syndrome. However, if there is a metastases to the liver are present, the bioactive amines can not be metabolized and enter the systemic circulation causing abdominal cramps, diarrhea, GI bleeding, malabsorption, flushing, bronchospasm, and valvular disease of the right heart from serotonin-mediated fibroelastosis.
- Carcinoids can spread to local lymph nodes, including the liver. An elevated 5-HIAA level is diagnostic of carcinoid syndrome.
- The gastroesophageal junction is affected by gastroesophageal reflux disease, not carcinoid tumors. The rectosigmoid junction and splenic flexure is not a common location for carcinoid tumors.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Intestinal Carcinoid Cancer

StatPearls Knowledge Base

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## Question 812:

A 45-year-old female with no significant past medical history present to the primary care clinic to establish care. She said she has no active complaints. However, during the examination, she was found to have neck mass which appears to be thyroid nodule. According to her, when she swallows sometimes, she feels some discomfort. Her mother has hyperthyroidism and is currently taking anti-thyroid medication. She was referred for a fine needle aspiration to rule out cancer. Fine needle aspiration can confirm a diagnosis in all thyroid disorders except which of the following?

## Choices:

1. Hurthle cell cancer
2. Papillary cancer
3. Anaplastic cancer
4. Medullary cancer

## Answer: 1 - Hurthle cell cancer

## Explanations:

- While Hurthle cell neoplasm can be diagnosed by fine needle aspiration, but it cannot differentiate adenoma from carcinoma.
- Aspiration cannot assess capsular or vascular invasion which determines the malignancy.
- All patients with Hurthle cell tumors should have surgery.
- After surgery, radioactive iodine is administered. This will destroy any residual thyroid tissue and occult cancer cells and also allow for the detection of any persistent cancer.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Follicular Thyroid Cancer

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## Question 813:

A 33-year-old woman is scheduled for islet cell transplantation. Before the procedure, the patient discusses the risks and benefits of the surgery with the surgeon. She asks the surgeon if her disease could be cured, and if there is a chance, she will never have to use exogenous insulin again. The surgeon informs the patient that patients experience varying levels of graft survival and function. Which one of the mentioned techniques would give this patient the best chance at achieving insulin independence?

## Choices:

1. Letting the graft sit in Hank solution at least 72 hours after harvest before infusion
2. Infusing the patient with grafts pooled from multiple donors
3. Placing the patient on antibiotics postoperatively
4. Bathing the patient's pancreas in a digestive enzyme solution to assist new islet cell graft incorporating into the patient's pancreas

## Answer: 2 - Infusing the patient with grafts pooled from multiple donors

## Explanations:

- Only a portion of islet cells infused will take to the recipient; many of the cells injected do not survive.
- Islet cells are pooled from multiple donors to create a graft with an adequate number of cells.
- Because the majority of cells that are infused do not survive, harvesting cells from a single donor will not produce a functional graft.
- Grafts must be infused within 72 hours of harvesting to ensure graft survival.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Islets Transplantation

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## Question 814:

A 17-day-old male neonate is brought to the emergency department with recurrent vomiting. His parents state that he has only had 1 wet diaper in the past 24 hours. He was born to a 28-year-old G2P2 mother via spontaneous normal vaginal delivery without complications. APGAR scores were 8 at 1 minute and 9 at 5 minutes. His parents refused newborn screening. Vital signs reveal a blood pressure of 46/30 mmHg, temperature 37.2 C (98.96 F), and pulse 220 beats per minute. Weight is 6.9 pounds (110.4 ounces). For reference, his birth weight was 7.4 pounds (118.4 ounces). Physical exam reveals a lethargic neonate with a sunken fontanel. Testes are descended bilaterally, and urinary meatus is present at the tip of the glans penis. Laboratory results reveal sodium of 129 mEq/L and potassium of 6.2 mEq/L. An intravenous (IV) bolus of 20 ml/kg of normal saline is given. Before beginning treatment with hydrocortisone stress doses, a blood sample is obtained for several measurements. Which one of the following levels is most likely to be elevated?

## Choices:

1. Androstenedione
2. Cortisol
3. 17-hydroxyprogesterone
4. 11-deoxycorticosterone

## Answer: 3 - 17-hydroxyprogesterone

## Explanations:

- 21-hydroxylase deficiency results in impaired production of cortisol and aldosterone. Depleted volume status, hypotension, decreased sodium, and elevated potassium are consistent with an adrenal crisis in the setting of classic 21-hydroxylase deficiency. Specifically, this is the salt-losing form, which is particularly common in male neonates.
- 21-hydroxylase is the enzyme that converts progesterone to 11-deoxycorticosterone in the aldosterone synthesis pathway. It is also the enzyme that converts 17-hydroxyprogesterone to 11-deoxycortisol in the cortisol synthesis pathway. Thus a buildup of the substrate, 17-hydroxyprogesterone, would be expected.
- The deficiency in cortisol causes a rise in adrenocorticotropic hormone (ACTH) levels. The rise in ACTH stimulates steroidogenesis, but because cortisol and aldosterone cannot be produced, adrenal androgens are produced in excess. We would expect virilization because of the increase in androgens. Virilization may not be as apparent in a male neonate. Contrast this with a female neonate who would present with ambiguous genitalia.
- An elevated level of 11-deoxycorticosterone would be expected in a deficiency of 11-beta-hydroxylase, the enzyme that converts 11-deoxycorticosterone to corticosterone. In this disease, the elevation of 11-deoxycorticosterone causes hypertension, hypernatremia, and hypokalemia because of its high mineralocorticoid activity.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Physiology, Adrenal Gland

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## Question 815:

A 13-year-old male presents to the outpatient clinic with complaints of right breast tenderness and swelling. He has no significant past medical history. Physical examination is notable for a 1.5 cm tender, firm, mobile mass beneath the right nipple without any skin changes or discharge. The remainder of the examination is normal. Tanner's stage is 3 with dark pubic hair and bilateral scrotal volume of 8 ml. The rest of the physical examination is unremarkable. Which of the following is the next step in the management of this patient?

## Choices:

1. Referral for excisional biopsy
2. Measurement of estrogen, prolactin, and testosterone
3. Reassurance
4. MRI of the pituitary

## Answer: 3 - Reassurance

## Explanations:

- Gynecomastia occurs in a large percentage of adolescent males. Treatment of this condition consists first of treating any underlying condition if this is contributing to the condition. If the condition has been present less than one year, and the history and physical are within normal limits, observation can be done with close follow-up.
- It can be bilateral, unilateral, or asymmetrical. Healthy males with no associated symptoms or physical abnormalities other than long-standing gynecomastia (more than 12 months) need no further workup. However, if symptoms are present, or if there are positive physical exam findings, these should be investigated first.
- It is felt to be secondary to an imbalance of estradiol and testosterone.
- It resolves spontaneously in less than 18 months.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Gynecomastia

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## Question 816:

A 37-year-old woman presents to the office due to chest pain. She states that the pain is squeezing in character and started about 2 weeks ago. So far, it has been getting worse. The pain occurs both at rest and during exertion. She denies nausea, vomiting, diaphoresis, or radiation of the pain. Her past medical history is unremarkable except for peripheral artery disease of her right leg. Her mother died of a heart attack at the age of 49 years. Her vitals show a temperature of 98.5 F, pulse 86min, respiratory rate 16/min, and blood pressure 132/86 mmHg. She appears to be in mild distress. Clear vesicular breath sounds are heard on auscultation. Normal S1 and S2 heart sounds are noted. Her abdomen is soft, full, non-tender, and nondistended. Which of the following abnormalities is most likely responsible for this patient's condition?

## Choices:

1. Increased apolipoprotein E levels
2. Increased apolipoprotein B100 levels
3. Increased low-density lipoprotein receptor activity
4. Increased high-density lipoprotein levels

## Answer: 2 - Increased apolipoprotein B100 levels

## Explanations:

- This patient most likely has familial combined hyperlipidemia. This condition is caused by a deficiency of low-density lipoprotein receptors and an increase in apolipoprotein B100.
- Patients with this condition are at increased risk of atherosclerotic vascular diseases and cardiovascular diseases.
- Low-density lipoprotein and very-low-density lipoprotein levels are often increased. Clinically, patients present with signs and symptoms of ischemic heart disease, peripheral vascular disease, or stroke-like symptoms.
- Diagnosis is made with the combination of history, physical exam findings, and lipid profile. Management involves lifestyle modifications and lipid-lowering medications such as statins, niacin, or fibrates. Acute symptoms are treated based on the underlying cause.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hypercholesterolemia

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## Question 817: A 66-year-old male patient known to have hypertension presents to the hospital with palpitation and muscle pain. His serum potassium level was found to be 5.9 mEq/L. His current medications include lisinopril and bisoprolol. What is the underlying mechanism of hyperkalemia in this patient?

## Choices:

1. Decreased aldosterone secretion and inhibition of sodium-potassium ATPases
2. Inhibition of sodium-potassium ATPases
3. Decrease in aldosterone release
4. Aldosterone receptor blockage

## Answer: 1 - Decreased aldosterone secretion and inhibition of sodium-potassium ATPases

## Explanations:

- Both lisinopril and bisoprolol can cause hyperkalemia. However, the mechanism is slightly different. Lisinopril inhibits the angiotensin-converting enzyme which leads to a decrease in the formation of angiotensin II. decreased formation of angiotensin II leads to decreased activation of the adrenal cortex to release aldosterone. The reduction in aldosterone leads to potassium retention and salt and water wasting.
- Bisoprolol causes hyperkalemia through two mechanisms. It inhibits the sodium-potassium ATPases and renin release, both of which will lead to an increase in the serum potassium level.
- Bisoprolol inhibits the entry of potassium into the cells and the efflux of sodium from the cells. This action is mediated by inhibition of sodium-potassium ATPases
- Aldosterone receptor blockade is seen with spironolactone. Blocking aldosterone receptors leads to salt and water wasting and potassium retention.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Bisoprolol

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## Question 818:

A 12-year-old boy is brought to the clinic for a routine well-child visit. His mother is concerned about his weight. His father was diagnosed with diabetes one year ago, and his paternal grandfather has hypertension and diabetes. His anthropometric measures show weight 82 kg, height 158 cm, and BMI 32.8 kg/m2 (>99th percentile). His vital signs show blood pressure 124/78 mmHg, pulse 78/min, respiratory rate 20/min, and temperature (36.8°C (98.3°F). His examination findings are within normal limits. Which of the following is one of the best initial tests in the evaluation of this patient?

## Choices:

1. Complete blood count
2. Fasting insulin and glucose
3. Thyroid function test
4. Iron and ferritin

## Answer: 2 - Fasting insulin and glucose

## Explanations:

- Childhood obesity quadruples the risk of developing glucose intolerance and non-insulin-dependent diabetes. Over 85% of children with type 2 diabetes mellitus are either overweight or obese at diagnosis.
- Fasting insulin, glucose, liver function tests, and a lipid profile should be included in the evaluation of childhood obesity.
- Acanthosis nigricans is an increased pigmentation and thickness of the skin in intertriginous folds, and it is usually associated with glucose intolerance in children and adolescents.
- The risk factors for type 2 non-insulin-dependent diabetes and metabolic syndrome include children with BMI 85th to 95th percentile and immediate family history of type 2 diabetes or signs of insulin resistance such as acanthosis nigricans, dyslipidemia, hypertension, and polycystic ovarian syndrome. BMI greater than the 95th percentile regardless of family history or associated feature is a significant risk factor for diabetes.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Obesity Effects On Child Health

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## Question 819:

A 59-year-old female is asking about hormonal replacement therapy. She does not complain of any symptoms. Her past medical history is significant for hypertension and hyperlipidemia. She is taking hydrochlorothiazide and atorvastatin. She went through menopause at the age of 48 and experienced hot flashes and mood swings. She did not receive treatment at that time, and the symptoms resolved spontaneously. Blood pressure is 120/81 mmHg, and pulse is 75 beats/min. Her total cholesterol is 181 mg/dL, HDL is 63 mg/dL, and LDL is 110 mg/dL. She was told by her friend that combined estrogen/progesterone menopausal hormonal therapy for women her age can slow down the aging process and make her healthier. She is asking about the risks and benefits of using combined estrogen/progesterone therapy. Which statement is true about combined estrogen/progesterone hormonal therapy?

## Choices:

1. It can decrease the risk of breast cancer
2. It is associated with a decrease in all-cause mortality in women 50-59 years
3. It can increase the risk of diabetes mellitus type 2
4. It can increase the risk of colon cancer

## Answer: 2 - It is associated with a decrease in all-cause mortality in women 50-59 years

## Explanations:

- Combined estrogen/progesterone menopausal hormone therapy (MHT) is an effective treatment for menopausal symptoms such as hot flashes.
- Studies have shown that MHT is associated with an increased risk of venous thromboembolism, stroke, and breast cancer. However, women ages 50 to 59 have a decreased risk for these adverse effects. Hence MHT can be used for a few years in these women to treat menopausal symptoms.
- Other beneficial effects of MHT include the decreased risk of colon cancer, diabetes mellitus type 2, and all-cause mortality for women ages 50-59 years.
- Studies have not shown that MHT is effective at slowing down the aging process.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Menopause

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## Question 820:

A 65-year-old man with Paget disease of bone with contraindications to bisphosphonate usage has been prescribed a drug that prevents bone matrix resorption. This drug is an analog of a hormone produced by the parafollicular cells of the thyroid. Serum alkaline phosphatase (ALP) initially falls, demonstrating the response to therapy. However, ALP again rises to baseline at a six-month follow-up. This is most likely due to which of the following?

## Choices:

1. Anti-calcitonin antibodies
2. Anti-PTH antibodies
3. Cholestasis
4. Sarcoidosis

## Answer: 1 - Anti-calcitonin antibodies

## Explanations:

- In the treatment of Paget disease, calcitonin can relieve bone pain, reverse neurologic deficits and reduce blood flow to the diseased bone.
- It has a peak onset at 24-48 hours.
- The response to calcitonin can be measured via serum ALP and/or hydroxyproline levels.
- However, the effectiveness of calcitonin may be reduced overtime via the production of anti-calcitonin antibodies.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Calcitonin

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## Question 821:

A 52-year-old woman comes to the clinic for follow-up evaluation. She was diagnosed with myasthenia gravis two years ago. She is being treated with pyridostigmine 120 mg every 4 hours. She is compliant with the treatment, but still, reports increased muscle weakness and blurry vision. Which of the following is most likely to improve her symptoms long term?

## Choices:

1. Adding corticosteroids to the regimen
2. Increasing dose of pyridostigmine
3. Thymectomy
4. Plasmapheresis

## Answer: 3 - Thymectomy

## Explanations:

- Thymectomy has shown to improve the symptoms of myasthenia gravis long term.
- Thymectomy is recommended in patients without thymoma less than 60 years of age.
- The dose of pyridostigmine (120mg) in this patient is already very high. Further increasing the dose can cause cholinergic side effects.
- The employment of plasma exchange therapy only has short term effects.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Thymic Hyperplasia

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## Question 822:

A 32-year-old woman presents to the clinic with complaints of weight loss, palpitations, heat intolerance, and difficulty sleeping. On physical exam, she has an anterior neck swelling. Graves disease is suspected, and blood work is drawn for further testing. The specimen is tested using an ELISA technique that mixes the patient sample with a secondary enzyme-conjugated antibody. Once the ELISA is completed, there is no color change, and the diagnosis of Graves disease is confirmed. Which of the following best describes the reaction that occurred with the patient's sample?

## Choices:

1. Patient antibody outcompeted secondary enzyme-conjugated antibody
2. Secondary enzyme-conjugated antibody outcompeted patient antibody
3. Patient antibody bound equal antigen sites to the secondary enzyme-conjugated antibody
4. The patient antibody did not bind antigen

## Answer: 1 - Patient antibody outcompeted secondary enzyme-conjugated antibody

## Explanations:

- The competitive ELISA tests for the presence of an antibody specific for antigens in the test serum. This type of ELISA utilizes two specific antibodies, an enzyme-conjugated antibody and another antibody that is present in the test serum (if the serum is positive).
- Combining the two antibodies into the wells will allow for a competition for binding to antigen.
- The absence of color in a competitive ELISA indicates a positive test and the presence of antibodies in the test serum. ELISAs can be used to detect autoantibodies as in Graves disease.
- The presence of a color change means that the test is negative because the enzyme-conjugated antibody bound the antigens (not the antibodies of the test serum) and outcompeted the test sample.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Enzyme Linked Immunosorbent Assay

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## Question 823:

A 53-year-old female presents to the clinician due to concerns regarding her heart. She explains that her mother died at age 54 from "a bad heart." The patient's history is significant for a 30 pack-year history of smoking, type 2 diabetes mellitus, and osteoarthritis. She is afebrile with a pulse of 78 beats per minute, a respiratory rate of 12 breaths per minute, a blood pressure of 130/87 mmHg, a temperature of 98.7 degrees Fahrenheit and a body mass index of 23 kg/m2. Upon inspection, the patient has hard nodules in several proximal interphalangeal joints of her right hand and 3+ edema in bilateral lower extremities with decreased sensation bilaterally. There is an ulcer on the medial malleolus with deep flat margins. The patient explains that she noticed the ulcer three weeks ago but since as it did not hurt, she thought it would go away without treatment. Which of the following medications could be contributing to these findings and may increase her risk of adverse cardiac events?

## Choices:

1. Sodium-glucose co-transporter 2 inhibitors (SGLT2)
2. Biguanides
3. Thiazolidinediones
4. Meglitinides

## Answer: 3 - Thiazolidinediones

## Explanations:

- Thiazolidinediones, also known as glitazones or TZDs, are a class of type 2 diabetes medications first introduced in the late 1990s that work by lowering insulin resistance and are associated with edema and heart failure. SGLT2 inhibitors commonly cause glucosuria, an increased risk of urinary tract infections, and orthostatic hypotension.
- Biguanides (e.g., metformin) are associated with lactic acidosis and weight loss.
- Thiazolidinediones, also known as glitazones or TZDs, are a class of type 2 diabetes medications that are known to cause a potentially significant increase in fluid retention and edema, as seen in the patient with 3+ bilateral lower extremity edema. The fluid retention can be superimposed on preexisting, but unrecognized heart failure. This risk is typically seen after an extended length of treatment and may be dose-independent. Patients on these medications should be monitored for signs of heart failure, such as edema and weight gain.
- Meglitinides are associated with hypoglycemia and weight gain. While thiazolidinediones are also associated with weight gain, this is partially caused by fluid retention, which also increases the risk of heart failure.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Thiazolidinediones

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## Question 824:

A 65-year-old woman is being evaluated for osteoporosis. She had natural menopause at age 53. She has had no surgeries and takes no medications. On examination, she is well-nourished without pallor. Her serum calcium (Ca), albumin, ionized calcium (iCa), 25-OHD, liver, and renal functions are all normal. However, her PTH was persistently elevated (104 and 108 pg/mL on two different occasions), but repeat corresponding ionized calcium values are consistently normal. After 3 days of a calcium-free diet, she undergoes an oral 1 gram calcium loading test, which shows: at zero time iCa is 4.8 mg/dL (normal values 4.5 to 5.6 mg/dL) and PTH 109 pg/mL. After 120 minutes, iCa is 5.8 mg/dL and PTH 99 pg/mL. Which of the following intracellular abnormalities is most likely responsible for this patient's parathyroids?

## Choices:

1. An increase in the number of calcium-sensing receptors (CaSR)
2. An increase in the mitotic index (Ki-67)
3. An increase in cyclin D1
4. An increase in vitamin D receptors (VDR)

## Answer: 3 - An increase in cyclin D1

## Explanations:

- This patient has elevated PTH and normal Ca. She has normal 25-OHD, renal function, and is not on any medications and is therefore unlikely to have secondary normocalcemic hyperparathyroidism(nSHPT). She is more likely to have normocalcemic primary hyperparathyroidism (nPHPT). A calcium loading test is used to distinguish nSHPT from nPHPT. In the former, there is significant suppression of PTH when calcium loading is done, temporarily increasing serum calcium. In the latter, the PTH secretion is autonomous and suppresses poorly with calcium loading as in this patient.
- Ultrastructural and molecular pathology tests have revealed that in nPHPT patients, there is no change in CaSR, chromogranin A, PTH, or Ki67 index, features that are common to normal parathyroids.
- On the other hand, a depressed VDR number and increased cyclin D1 are abnormalities that make it different from normal glands and resemble pathological glands. Cyclin D1 is a protein that regulates the cell cycle, and its overexpression is a feature of tumors like parathyroid adenomas.
- It has been postulated that the discordance between CaSR and VDR or CaSR and cyclin D1 or both may be a reason for maintaining normocalcemia in nPHPT patients even in the presence of autonomous PTH elevation.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Normocalcemic Hyperparathyroidism

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## Question 825:

A 41-year-old female patient presented with galactorrhea. She had amenorrhea for the past 8 months. During the past week, she also noticed that there is a decreased vision on the right. Past medical history is only pertinent for hypothyroidism on a replacement for the last 3 years with adequate thyroid function. The pregnancy test was negative. She is found with 20/100 on the right eye and 20/30 on her left eye. Confrontation test reveals bilateral temporal hemianopia more prominent on the right. What is the most probable cause if her visual problem?

## Choices:

1. Presbyopia
2. Thyroid deficiency
3. Pituitary adenoma
4. Thyroid Ophthalmopathy

## Answer: 3 - Pituitary adenoma

## Explanations:

- Intracranial tumors can cause compressive optic neuropathy if they compress the optic nerve and chiasm intracranial or if they extend into the orbit through the optic canal. These tumors include pituitary adenomas, meningiomas, and metastases.
- Patients with compressive optic neuropathy typically present with slowly progressive or chronic vision loss in one or both eyes.
- The patient or the patient's relatives may note the development of proptosis or exophthalmos with an intraorbital lesion
- A patient with amenorrhea and galactorrhea which is not pregnant most probably has pituitary adenoma producing increased levels of prolactin.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Compressive Optic Neuropathy

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## Question 826:

A 47-year-old high school teacher is evaluated by her gynecologist for irregular menses for the past six months. She has no other illnesses, does not use tobacco, alcohol, or recreational drugs. Her family history is unremarkable, and a review of systems is not contributory. On physical examination, her BMI is 24 kg/m2. Her vital signs, cardiovascular, respiratory, abdominal, breast, and pelvic examinations are all normal. Palpation of her spine reveals no tenderness or deformity, and hip joints are normal. Blood tests show normal liver and renal function tests, serum 25 hydroxyvitamin D3 of 38 ng/ml, total calcium (Ca) 9.2 mg/dl (normal range 8.5-10.4), and intact parathyroid hormone (PTH) of 107 pg/ml (normal 10-65). An abdominal and pelvic ultrasound shows normal uterus and ovaries. There were two calculi in the left kidney and one in the right kidney, all measuring between 3.3 and 3.8 mm. The kidneys are of normal size, and there is no hydronephrosis. She is referred to the endocrine clinic. The serum ionized Ca and intact PTH values in the endocrine clinic are 4.7 mg/dl and 118 pg/ml, respectively (normal ionized Ca value range 4.5 to 5.6mg/dl). What is the next best step in her management?

## Choices:

1. Start cinacalcet 30 mg twice daily and repeat Ca and intact PTH after one month
2. Refer the patient to a surgeon for parathyroidectomy
3. Order a 24-hour urine evaluation for Ca and creatinine to guide further decisions
4. Monitor Ca levels and intervene only if it goes higher than the upper limit of normal, or the renal function deteriorates, or she develops symptoms

## Answer: 2 - Refer the patient to a surgeon for parathyroidectomy

## Explanations:

- This patient has normocalcemic primary hyperparathyroidism (nPHPT, high PTH in the face of normal corrected total calcium and ionized calcium), which is a phenotypic variant of sporadic primary hyperparathyroidism. It must be firmly established that she does not suffer from normocalcemic secondary hyperparathyroidism (nSHPT) in the first place before subjecting her to surgery. The most common causes of secondary hyperparathyroidism (which is also characterized by normal total and ionized Ca and high intact PTH) are vitamin D deficiency(VDD) and chronic kidney disease(CKD). Both of these conditions are ruled out in this patient. Other causes of nSHPT (e.g.malabsorption syndromes) are unlikely in this patient, given her history, examination, and laboratory investigations. She is not on medications that might cause a similar biochemical picture.
- She is asymptomatic and fulfills two criteria for surgery, according to the expert panel of the Fourth International Workshop on Asymptomatic Primary Hyperparathyroidism and endorsed both by the American Association of Clinical Endocrinologists (AACE) and the American Association of Endocrine Surgeons (AAES). These are age less than fifty years and of nephrolithiasis (even without symptoms).
- nPHPT patients who have calculi do not always have symptoms or hypercalciuria. Factors apart from hypercalciuria are implicated in its pathogenesis. Therefore parathyroidectomy(PTX) decreases the future risk of calculi considerably but does not eliminate it. The renal function is stabilized after PTX. Some studies have shown increased nephrolithiasis in nPHPT compared to classical PHPT.
- PTX is the only definitive cure for the disease. To wait until calcium increases or complications develop is substandard medical practice as worsening morbidity from renal failure, symptomatic calculi, and nephrocalcinosis can occur in the future. A twenty-four hours urine will detect hypercalciuria and risk for renal calculi. In this patient, a urine evaluation will add nothing further as she already has calculi. There is not enough evidence of the efficacy of cinacalcet in nPHPT and nephrolithiasis, and this treatment cannot be recommended routinely.

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## Research Concepts:

### Normocalcemic Hyperparathyroidism

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## Question 827:

A 50-year-old woman presents complaining of a one-month history of worsening fatigue and depressed mood. Her serum sodium level is 130 mEq/L, and her potassium level is 6.0 mEq/L. On examination, her skin and oral mucosa appear darkened. Which of the following is the best initial test in the evaluation of this patient?

## Choices:

1. Serum antidiuretic hormone level
2. Serum aldosterone level
3. Adrenocorticotropic hormone stimulation test
4. Thyroid-stimulating hormone level

## Answer: 3 - Adrenocorticotropic hormone stimulation test

## Explanations:

- This patient has signs and symptoms consistent with a diagnosis of Addison disease. Addison disease is an acquired primary adrenal insufficiency. A primary adrenal insufficiency is termed Addison disease when an autoimmune process causes the condition.
- Addison disease results from bilateral adrenal cortex destruction leading to decreased adrenocortical hormones, including cortisol, aldosterone, and androgens.
- Adrenal failure in Addison disease results in decreased cortisol production initially followed by that of aldosterone, both of which will eventually result in an elevation of adrenocorticotropic (ACTH) and melanocyte-stimulating hormone (MSH) hormones due to the loss of negative feedback inhibition. Thus, the most appropriate next step in the management of this patient is to order an ACTH stimulation test to confirm the diagnosis.
- Often the diagnosis is made only after the patient presents with an acute adrenal crisis (hypotension, hyponatremia, hyperkalemia, and hypoglycemia). This may be precipitated by a stressful illness or triggering factors such as infection, trauma, surgery, vomiting, or diarrhea. Significant stress or illness can unmask cortisol and mineralocorticoid deficiency.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Addison Disease

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## Question 828:

A 50-year-old male with a history of cystic fibrosis and recent lung transplantation is being evaluated for possible preventive therapy for post-transplantation osteoporosis. The patient is on an immunosuppressive regimen that includes high-dose steroids. Laboratory testing reveals a hemoglobin level of 12.0 g/dl, BUN 15 mg/dl, serum creatinine 0.66 mg/dl, albumin level 3.5 g/dl, calcium level 9.1 mg/dl, and a 25-hydroxy vitamin D level of 70 ng/ml. The patient is receiving adequate vitamin D and calcium replacement. A spine radiograph performed is negative for fractures. A bone densitometry scan shows a T-score of -0.9 at the lumbar spine and 0.0 at the femoral neck. A decision to start preventive therapy with bisphosphonates is made. As per current consensus, what should be the duration of therapy for this patient?

## Choices:

1. Treat the patient throughout his life as he will likely be maintained on immunosuppressive therapy lifelong
2. Treat the patient for the first three months after transplantation and then re-assess with bone densitometry to delineate the need for continued therapy
3. Treat the patient for 12 months after transplantation and then re-evaluate with bone densitometry to delineate the need for continued therapy
4. Treat the patient intermittently with bisphosphonate therapy with drug holidays every 5-10 years, provided the bone mineral density remains stable

## Answer: 3 - Treat the patient for 12 months after transplantation and then re-evaluate with bone densitometry to delineate the need for continued therapy

## Explanations:

- The current consensus is to treat otherwise low-risk transplant recipients for 12 months after transplantation for osteoporosis prevention and then re-evaluate to delineate the need for continued therapy.
- If this patient's bone mineral density remains stable after one year, bisphosphonate therapy can be discontinued, and the patient can be monitored with serial bone densitometry scans even if he continues to remain on an immunosuppressive regimen. Some studies indicate that there is a benefit in continuing bisphosphonate therapy in patients who are on a glucocorticoid dose of more than 5 mg per day after one year.
- Intermittent bisphosphonate therapy with drug holidays every 5 years, provided the bone mineral density remains stable, is the recommended therapy for documented osteoporosis. This patient does not have osteoporosis and hence will not need long-term treatment unless indicated.
- Treatment for only 3 months after transplantation is inadequate as the risk of osteoporosis and fracture is elevated up to the first 6 to 12 months after most organ transplantations.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Transplantation Osteoporosis

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## Question 829:

A 48- year-old woman presents to the clinic 4 days back with palpitations and heat intolerance for the past few weeks. She also complains of weight loss and diarrhea over this period. On examination, she has proptosis, lid lag, sweaty palms, a firm mass in the neck which moves with swallowing, normal S1 S2, soft non-tender abdomen with no organomegaly, and clear bilaterally equal beath sounds. Her temperature is 98.7 F, blood pressure 122/78 mmHg, heart rate 87/min irregular, and respiratory rate 18/min. She is on hydrochlorothiazide and losartan for hypertension, warfarin for persistent atrial fibrillation, and aspirin. On today's visit, her radioactive iodine uptake scan (RAIU) shows diffuse uptake, and a decision is made to start propylthiouracil based on patient preferences. What is the most important test to be done in this patient before prescribing propylthiouracil?

## Choices:

1. White blood count
2. Serum transaminases
3. Renal function test
4. Prothrombin time

## Answer: 4 - Prothrombin time

## Explanations:

- Propylthiouracil blocks Vitamin K activity as well which may potentiate the activity of warfarin in this patient and lead to bleeding.
- Additional monitoring of PT/INR is required in this patient to adjust the levels of both drugs.
- Agranulocytosis is a well-documented side effect of propylthiouracil, but routine monitoring of white blood cell count is not cost-effective. It should be done if a patient has a generalized malaise, fever, sore throat, or any other reported signs of infection.
- Acute liver injury is a well-documented side effect of propylthiouracil but routine monitoring of serum transaminases is not cost-effective. It should be done if the patient presents with signs and symptoms of liver disease. Acute kidney injury is a reported side effect of propylthiouracil but does not require routine tests.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Propylthiouracil (PTU)

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## Question 830:

A 29-year-old man has complaints of frequent muscle cramps and recurrent kidney stones. He had been operated for renal calculi last year and now again he is having flank pain and hematuria. His clinical examination reveals mild tenderness at the right flank. His plain kidney urinary bladder (KUB) radiograph reveals right-sided kidney stones. His rest of the investigations reveal serum calcium of 6.4 mg/dl, serum phosphate at 6 mg/dl, and 24-hour urinary calcium excretion is elevated at 400mg. His mother and maternal grandfather had also been diagnosed with hypocalcemia. What is the most likely etiology of this patient's hypocalcemia?

## Choices:

1. A genetic mutation of the vitamin D receptor
2. An activating mutation of the calcium-sensing receptor
3. Increased secretion of fibroblast growth factor (FGF) 23
4. Inherited deficiency of the vitamin D 1-alpha hydroxylase

## Answer: 2 - An activating mutation of the calcium-sensing receptor

## Explanations:

- This patient has hypoparathyroidism. An activating mutation of the calcium-sensing receptor leads to the decreased secretion of parathyroid hormone.
- It is an autosomal dominant disorder. It leads to hypocalcemia, hyperphosphatemia, and increased 24-hour urinary calcium excretion. The calcium-sensing receptor is a G protein-coupled receptor. When calcium binds to and activates this receptor, it results in decreased secretion of parathyroid hormone.
- Patients with autosomal dominant hypocalcemia are at high risk of urolithiasis, renal calcifications, and decreased renal function when treated with calcium and calcitriol. The goal of treatment is to maintain the serum calcium in the low-normal range, or even slightly low in order to avoid renal complications.
- Fibroblast growth factor (FGF) 23 is secreted by osteocytes. It decreases the renal tubular reabsorption of phosphate, increases excretion of phosphate, and high levels can cause hypophosphatemia.

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## Research Concepts:

### Hypoparathyroidism

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## Question 831:

A 56-year-old male sustains a spinal cord injury during a motor vehicle collision. His vitals include a pulse of 120 beats/minute, and his blood pressure is 95/65 mmHg. After initial resuscitation, a clinician examines the patient for neurological deficits. The patient has no sensation from his waist down, and the power of his muscles in both of the lower limbs is grade 0. He has lost his micturition and defecation reflexes. The clinician suspects the patient will experience a bone-related complication due to the spinal cord damage and prescribes calcium and vitamin D supplements. At which time after the injury is the patient most likely to have the most rapid development of the expected bone-related complication?

## Choices:

1. The initial 2 weeks following the injury
2. 1 year following the injury
3. 3 to 5 years following the injury
4. More than 5 years following the injury

## Answer: 1 - The initial 2 weeks following the injury

## Explanations:

- Multiple studies have demonstrated that the first two weeks following a spinal cord injury is the period when the most rapid decreases in bone mineral density occur.
- Body regions below the level of the spinal cord injury are the most susceptible to bone mineral density loss.
- Trabecular bone loss occurs at a rate of approximately 4% per month following a spinal cord injury.
- Patients with spinal cord injuries should be immediately referred to a bone metabolic center or clinic, or establish early and regular care with an experienced physician capable of treating and preventing osteoporosis. Historically, follow-up rates for patients with osteoporosis are notoriously low, given the lack of a standardized care pathway. Treating physicians can include general practitioners, internists, rehabilitation specialists, endocrinologists, and orthopedic surgeons.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Osteoporosis in Spinal Cord Injuries

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## Question 832:

A 16-year-old female with a history of diabetes mellitus type 1 is admitted due to extreme fatigue, dehydration, and abdominal pain. Her initial laboratory data revealed glucose of 688 mg/dL, sodium of 128 mEq/L, potassium of 5.7 mEq/L, bicarbonate of 5 mEq/L, and a pH of 6.99. She has received 2 liters of normal saline bolus infusion with 10 units of intravenous insulin bolus infusion in the emergency department. She is now on an insulin drip. One hour later, she complains of a headache and "feeling fuzzy." She can communicate but seems confused and is intermittently agitated. Her bedside glucose testing reveals glucose of 210 mg/dL. Which of the following is the next best step in the management of this patient?

## Choices:

1. Start dextrose infusion
2. Start intravenous mannitol infusion
3. Obtain a magnetic resonance imaging scan of the brain
4. Increase insulin infusion rate and check serum potassium

## Answer: 2 - Start intravenous mannitol infusion

## Explanations:

- The patient has severe diabetic ketoacidosis (DKA) on admission. She then develops mental status changes that are concerning for the development of cerebral edema.
- Cerebral edema may present after the initiation of appropriate therapy for DKA, however, it is less common in adults than in children.
- Risk factors include younger age, new-onset diabetes, longer duration of symptoms, lower partial pressure of carbon dioxide, severe acidosis, low initial bicarbonate level, low sodium level, high glucose level at presentation, rapid hydration, and retained fluid in the stomach.
- This is a life-threatening complication of DKA and warrants immediate treatment if suspected to avoid mortality.

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## Research Concepts:

### Adult Diabetic Ketoacidosis

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## Question 833: A patient with diabetes mellitus complains of gastric reflux, postprandial fullness, and occasional vomiting. A nuclear medicine study shows delayed gastric emptying. Which of the following medications should be prescribed?

## Choices:

1. Famotidine
2. Pantoprazole
3. Metoclopramide
4. Cisapride

## Answer: 3 - Metoclopramide

## Explanations:

- Diabetic gastroparesis can be treated with metoclopramide or erythromycin.
- Cisapride is only available for compassionate use due to QT prolongation and torsades de point.
- Neither proton pump inhibitors or H2 blockers will improve gastric emptying.
- The condition may improve with tighter glucose control.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Diabetic Gastroparesis

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## Question 834:

A 9-year-old girl with a history of thyroid goiter is brought to the clinic with progressive hearing loss, one month after head trauma. Genetic testing confirms the diagnosis of Pendred syndrome. Although Pendred syndrome is known by its effect on iodide organification, the typical thyroid presentation is euthyroid goiter and only a few patients present with abnormal thyroid function. Which of the following best explains this finding?

## Choices:

1. Thyroid organification is not responsible solely by pendrin protein
2. Most cases present early during the syndrome and thyroid function test could be normal initially
3. Wrong sampling and preservation of the sample
4. Most Pendred syndrome patients do not have thyroid involvement

## Answer: 1 - Thyroid organification is not responsible solely by pendrin protein

## Explanations:

- Multiple factors play a role in thyroid organification, and Pendrin protein is one of the factors, so Pendred syndrome leads to partial thyroid organification defect.
- Because of the partial thyroid organification defect in Pendred syndrome, euthyroid goiter is the typical presentation of the syndrome.
- Perchlorate test is a test for thyroid organification, and because there is a partial defect in Pendred syndrome, it does not always show the defect, especially if the patient has good iodine intake.
- Pendred syndrome usually presents with hearing impairment and euthyroid goiter.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Pendred Syndrome

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## Question 835:

A 27-year-old white male presents to the clinic with a history of polyuria and polydipsia for the last three weeks, along with fatty stools that are difficult to flush. On further questioning, he also mentions that he was recently married and had been having some problems with his erections. His temperature is 36.7 C (98.5 F), pulse rate is 86 beats/min, blood pressure is 120/80 mmHg, and respirations are 16 breaths/min. His physical examination reveals hyperpigmentation in his upper limbs, which he comments has been present for a long time. No other abnormalities are detected. The patient is started on pancreatic replacement therapy for his steatorrhea and an oral hypoglycemic agent for his diabetes mellitus. Which of the following agents is to be avoided in this patient?

## Choices:

1. Sitagliptin
2. Metformin
3. Voglibose
4. Glimepiride

## Answer: 3 - Voglibose

## Explanations:

- The patient has pancreatic exocrine and endocrine dysfunction secondary to hemochromatosis. The best way to manage steatorrhea is to supplement pancreatic enzymes. Oral hypoglycemic agents may be used to manage his diabetes mellitus. Concurrent administration of gastrointestinal enzyme replacement therapy reduces the efficacy of alpha-glucosidase inhibitors. Ideally, the administration of each drug should be at different times. But this may not be possible, considering both drugs are to be administered around mealtime. Hence, it is more appropriate to avoid this class.
- Hereditary hemochromatosis is an autosomal recessive disorder resulting from mutations in the HFE gene coding for hepcidin, transferrin, hemojuvelin, and ferroportin results in the increased absorption and deposition of iron in the body. Patients present with symptoms of diabetes mellitus, skin pigmentation, and hypogonadism, among others.
- The deposition of iron in the pancreas leads to reduced glandular function. This usually takes years to develop.
- In choosing the right management option, it is important to identify the class to which each drug belongs. Sitagliptin is a dipeptidyl peptidase-4 inhibitor, metformin is a biguanide, voglibose is an alpha-glucosidase inhibitor, and glimepiride is a sulphonylurea.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Pancrelipase Therapy

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## Question 836:

A 5-year-old child is brought by his mother as she is concerned that he is not growing or putting on weight appropriately. Despite repeated courses of antibiotics due to suspected enteric infections, his diarrhea does not subside. On examination, the child's bones are noticed to be bowed, there are numerous petechiae, and the skin appears dehydrated. The fundoscopy examination reveals dark spicules on the retina and a waxy disc. Blood tests show vitamin D deficiency and low cholesterol levels. Which molecular pathology underlies the condition from which the patient is most likely suffering?

## Choices:

1. Microsomal triglyceride transfer protein abnormality
2. Microsomal apolipoprotein abnormality
3. Absence of hypobetalipoproteinemia
4. Trisomy of the 13th gene pair

## Answer: 1 - Microsomal triglyceride transfer protein abnormality

## Explanations:

- A mutation of triglyceride transfer proteins (MTP) causes abetalipoproteinemia.
- It causes malabsorption of fats, fat-soluble vitamins (A, D, E, and K) and cholesterol, leading to delayed growth and development and disturbance of nervous system function.
- Abetalipoproteinemia or Bassen-Kornzweig syndrome is an autosomal recessive disease that interferes with the absorption of fat and fat-soluble vitamins. It is caused by a mutation in microsomal triglyceride transfer protein, which results in deficiencies in the apolipoproteins B-48 and B-100. These apolipoproteins are used in the synthesis and exportation of chylomicrons and very low-density lipoprotein (VLDL), respectively.
- The signs and symptoms appear in the first months of life. They can include failure to thrive, diarrhea, abnormal spiny red blood cells (acanthocytosis), and foul-smelling fatty stools (steatorrhea). The stool may contain large chunks of fat and blood. Dysfunction of the nervous system may develop, including poor muscle coordination, difficulty with balance, movement, and progressive degeneration of the retina that can progress to near-blindness. Adults in their thirties to forties may have increased difficulty with balance. Many of the signs and symptoms of this condition result from vitamin E deficiency, which results in eye problems with degeneration of the dorsal column and spinocerebellar tracts.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Abetalipoproteinemia

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## Question 837:

A 35-year-old woman with a BMI of 35 kg/m2 reports difficulties with losing weight despite her efforts to go to the gym once or twice a week. She has gained 18 kg in the last year. On dietary history recall, she has been having nighttime cravings over the last year. She typically wakes up from her sleep to eat ice cream and cookies. She also has a much larger appetite for dinner and will often eat an entire pizza along with sides like french fries and chicken nuggets. Her social history is significant for separation from her husband of 5 years. Review of symptoms is positive for occasional heart burn for which she takes over-the-counter antacids that help. Her physical exam is within normal limits. Her fasting labs show an LDL cholesterol of 120 mg/dl, ALT of 90 U/L with an A1c of 5.7%. What other symptom is likely to be associated with this specific eating disorder?

## Choices:

1. Morning anorexia
2. Muscle cramps
3. Excessive daytime sleepiness
4. Motor tics

## Answer: 1 - Morning anorexia

## Explanations:

- Night eating syndrome (NES) is defined by caloric intake > 25% of total daily intake after dinner (evening hyperphagia). The intake can sometimes be up to 50% of the total daily intake. Patients will typically have recurrent awakenings from sleep (nocturnal ingestions). They also report three of the following: morning anorexia, sleep onset and/or maintenance insomnia, frequently depressed mood or mood worsening in the evening, and a belief that one cannot get back to sleep without eating.
- Motor tics, muscle spasms, daytime sleepiness are not typically reported to be associated with NES.
- Although NES is largely characterized by nocturnal ingestions, these episodes also occur in sleep-related eating disorder (SRED). This disorder is characterized by recurrent episodes of involuntary eating and drinking during sleep. It is considered a parasomnia rather than an eating disorder. NES and SRED can be differentiated by a lower level of consciousness while eating, as well as the consumption of unusual substances with SRED.
- Individuals diagnosed with NES are more likely than those in the general population to have another eating disorder with prevalence estimates ranging from 5–44%.49 Approximately 15–20% of patients with NES also have binge eating disorder.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Eating Behaviors In Patients With Obesity

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## Question 838:

A 62-year-old woman presents with confusion and the inability to perform routine tasks. Her medical history is significant for celiac disease, hypertension, and psoriasis, for which she was started on anti-TNF therapy three months ago. She has never smoked or drank alcohol. She follows a gluten-free diet, and her other medications are aspirin and hydrochlorothiazide. On physical exam, her height is 66 inches (167.6 cm), and her weight is 123 lb (55.8 kg). Her blood pressure is 80/40 mmHg, pulse rate 50 beats/min, and temperature 34 C (93.2 F). She is disorientated and lethargic. There is no palpable thyroid enlargement, and there is nonpitting edema in both legs with delayed deep tendon reflexes on examination. Laboratory test results include hemoglobin 9 g/dl, WBC 7740 cells/cubic millimeter, platelets 150,000 cells/cubic millimeter, creatinine 1.8 mg/dl, sodium 129 mEq/l, potassium 3.8 mEq/L, chloride 93 mEq/L, bicarbonate 24.5 mEq/L, and undetectable free T4. Chest radiography and brain CT are normal. Blood and urine cultures are sent. The patient is started on intravenous fluid resuscitation. Which of the following should be ruled out before starting therapy for this patient's current condition as they can precipitate a crisis?

## Choices:

1. Myocardial infarction and adrenal insufficiency
2. Sepsis and adrenal insufficiency
3. Stroke and myocardial infarction
4. Stroke and sepsis

## Answer: 1 - Myocardial infarction and adrenal insufficiency

## Explanations:

- This patient is on anti-TNF therapy that can precipitate myxedema coma. She presents with confusion, bradycardia, hyponatremia, hypothermia, hypotension, anemia, nonpitting edema in both legs, delayed deep tendon reflex with undetectable free T4, which confirms the diagnosis of myxedema coma.
- Myocardial infarction and adrenal insufficiency should be ruled out before starting levothyroxine therapy in a patient with myxedema coma, as aggressive T4 replacement may increase the risk of myocardial infarction in these patients.
- Levothyroxine will increase cortisol metabolism, and hypothyroidism may mask an underlying adrenal insufficiency. Therefore, hydrocortisone should be administered before initiation of thyroxine therapy, especially if the patient is hypotensive, to avoid an adrenal crisis.
- A random cortisol level should be checked before the administration of levothyroxine therapy in all patients with suspected myxedema coma.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Myxedema

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## Question 839: A 30-year-old woman presents to the clinic with complaints of increased appetite. She requests an appetite suppressant. Which of the following substances has the strongest activity as an appetite-stimulating neuropeptide?

## Choices:

1. Insulin
2. Leptin
3. Neuropeptide Y
4. Proopiomelanocortin

## Answer: 3 - Neuropeptide Y

## Explanations:

- Neuropeptide Y is the most abundant peptide in the nervous system.
- It causes increased food intake, preferably carbohydrate-rich food, and reduce energy expenditure and thermogenesis.
- Neuropeptide Y expression increases with fasting.
- Neuropeptide Y expression decreases with food consumption.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Obesity Brain Gut Adipocyte Interaction

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## Question 840:

A 67-year-old white female presents to the emergency department with confusion via emergency medical services. She lives alone and was found by her son lying in bed. Current medications include metoprolol, lisinopril, and levothyroxine. Vitals are heart rate 50 bpm, respiratory rate 10/minute, blood pressure 100/70 mmHg, oxygen saturation 94%, and temperature 97.4 F. Which laboratory study is most appropriate to obtain?

## Choices:

1. Thyroid stimulating hormone
2. T3
3. Troponin T
4. Pro b-type natriuretic peptide

## Answer: 1 - Thyroid stimulating hormone

## Explanations:

- The diagnosis of myxedema coma, as with all other diseases, is heavily reliant on the history and physical exam. A past medical history including hypothyroidism is highly significant whenever decreased mental status or coma is identified. In the absence of identified hypothyroidism myxedema coma is a diagnosis of exclusion when all other sources of coma have been ruled out.
- If myxedema coma is suspected, evaluation of thyroid stimulating hormone (TSH), free thyroxine (T4), and serum cortisol is warranted. T4 will be extremely low. TSH is variable depending on the etiology of hypothyroidism with a high TSH indicating primary hypothyroidism and a low or normal TSH indicating secondary etiologies. Cortisol may be low indicating adrenal insufficiency because of the hypothyroidism.
- Serum T3 may be useful to know but is not clinically useful for initial diagnosis of hypothyroidism or myxedema coma. It is most important in the diagnosis of isolated T3 hyperthyroidism.
- Troponin T is a marker used to identify cardiac damage, most often in the setting of acute myocardial infarction. Pro-BNP is an indicator of cardiac distension often due to fluid overloading and is useful in the diagnosis of congestive heart failure exacerbations with fluid overloading.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Case Study: 60-Year-Old Female Presenting With Shortness of Breath

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## Question 841:

A 16-year-old boy is brought to the emergency department with complaints of an inability to move his both upper and lower limbs after halfway through a soccer match. He reports no fever, pain, and change in sensation in his limbs. He went to camping 1 month back does not recall any insect bite. He does not recall any recent illness and denies the use of any medication currently. He had a similar episode of muscle weakness a few months back, which resolved spontaneously. His vital signs are within normal limits. Cardiovascular, respiratory, and gastrointestinal examinations reveal no abnormality. On neurological examination, muscle strength is decreased, and knee and ankle reflexes are depressed. His touch, vibration, and proprioception sensations are intact. Laboratory work reveals sodium 140 mEq/L, potassium 2.2 mEq/L, serum urea nitrogen 16 mEq/L, creatinine 0.7 mg/dL, chloride 106 mEq/L, bicarbonate 24 mEq/L, and creatine kinase 1110 U/L. EKG shows depressed ST-segment and tall T waves. What is the best initial therapy for this patient?

## Choices:

1. Intravenous glucocorticoids
2. Plasma exchange
3. Oral potassium supplementation
4. Equine serum antitoxin

## Answer: 3 - Oral potassium supplementation

## Explanations:

- Sudden onset of flaccid paralysis in a young male patient with past medical of a similar episode with hypotonia and depressed deep tendon reflexes without changes in the sensation in the setting of hypokalemia strongly leads to suspicion of the hypokalemic periodic paralysis.
- Oral potassium solution is the initial management approach for the patient presenting with an attack of muscle weakness in hypokalemic periodic paralysis.
- Intravenous glucocorticoids, equine serum antitoxin, plasma exchange are ineffective in hypokalemic periodic paralysis. Administration of the oral potassium usually alleviates the symptoms of the hypokalemic periodic paralysis.
- Absence of fever, no insect bite, or any recent illness, intact sensation on examination, are helpful to rule out the possible causes of flaccid paralysis like acute viral myelitis, Guillian-Barre syndrome, or tick paralysis. The occurrence of the symptoms several hours after strenuous exercise, playing in a soccer match in this patient, is more suspicious for hypokalemic periodic paralysis. Prolonged rest after strenuous exercise is an identified triggering factor for flaccid paralysis in hypokalemic periodic paralysis.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hypokalemic Periodic Paralysis

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## Question 842:

A 40-year-old man presents for a follow-up 1 year after a successful sleeve gastrectomy. He has been following the recommended diet and exercise regimen. He has increased his weekly exercise time but has not seen a significant decrease in weight. He lost 50 kg postoperatively but has been unable to lose any weight for six weeks. Which of the following processes best explains his condition?

## Choices:

1. Increased leptin
2. Increased ghrelin
3. Hypothyroidism
4. Increased muscle efficiency

## Answer: 4 - Increased muscle efficiency

## Explanations:

- The patient is most likely has increased muscle efficiency as his muscles burn less cumulative calories despite exercising for longer durations of time.
- This happens due to muscle hypertrophy and lesser bodyweight to move; a patient who weighs 120 kg burns more calories than a patient who weighs100 kg. The less mass an individual has, the less energy needed to move.
- Other factors that result in plateau include decreased leptin, cholecystokinin, and peptide YY. This decreases the inhibitory action on ghrelin and increases appetite.
- The patient is probably experiencing adaptive thermogenesis, but this does not explain the interruption of weight loss despite additional exercise.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Post-Op Assessment and Management Of Obesity Surgery

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## Question 843:

A 16-year-old Hispanic woman presents complaining of generalized weakness for 3 days. She denies fever, vomiting, diarrhea, or shortness of breath. She was taking metformin 500 mg twice a day for several years and had canagliflozin added to her medication regimen 3 weeks ago. Insulin was discontinued 2 weeks prior to presentation when it was felt to no longer be needed for glycemic control. Serum glucose is 165 mg/dL, serum bicarbonate 14 mmol/L and an anion gap of 18 mmol/L. Ketones were present in the urine. What is the most likely diagnosis for the patient?

## Choices:

1. Ethelene glycol ingestion
2. Euglycemic diabetic ketoacidosis
3. Lactic acidosis
4. Salicylate induced acidosis

## Answer: 2 - Euglycemic diabetic ketoacidosis

## Explanations:

- The euglycemia is an initial distractor, but the patient story of medication changes and tightening glycemic control requiring the discontinuation of insulin indicates ketosis or starvation mode and the most likely diagnosis would be eDKA.
- This patient is within the common 2-month window of initiation of SGLT2 in a type2 diabetic patient.
- The patient has been taking metformin for an extended period of time. The newer agent of the SGLT2 is a more likely candidate for the eDKA development than is the metformin for lactic acidosis at this point in the patients' treatment.
- There is no salicylate ingestion in the patients' history however there is an extensive diabetic history with recent medication changes to raise concern for eDKA as the source of the acidosis.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Euglycemic Diabetic Ketoacidosis

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## Question 844:

A 49-year-old male presents for an evaluation. He complains of feeling tired easily. His past medical history is significant for end-stage renal disease, hypertension, diabetes mellitus type 2, peripheral vascular disease, and a history of transient ischemic attack (TIA). Vitals are normal. His medications include losartan, insulin glargine, aspirin, atorvastatin, and calcitriol. Laboratory values include hemoglobin 10.8 mg/dL, calcium 10.6 mg/dL, phosphorus 7.5 mg/dL, PTH 320 pg/mL, AST 34 units/L, ALT 49 units/L, CK 200 units/L. What is the most appropriate next step in management of this patient?

## Choices:

1. Increase calcitriol and add phosphate binder
2. Stop calcitriol
3. Consider parathyroidectomy
4. Continue the current management

## Answer: 2 - Stop calcitriol

## Explanations:

- This is a case of secondary hyperparathyroidism. Parathyroid hormone (PTH) is well controlled, calcium is within limits, but phosphate level is high. Calcitriol needs to be discontinued when calcium times phosphorus product is > 70 or when the patient has hypercalcemia.
- Secondary hyperparathyroidism is a physiologic response to a chronic hypocalcemic state. This can be caused by chronic kidney disease (CKD) or vitamin D deficiency.
- Calcitriol is the active form of vitamin D that is made in the kidney. In chronic kidney disease (CKD), the damaged kidneys fail to produce enough 1-alpha-hydroxylase, so they are unable to convert vitamin D into its active form.
- There is no role for parathyroidectomy in this patient. Phosphate binders can be added since phosphate level is high, but calcitriol cannot be increased further. Continuing medical management is not recommended.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Secondary Hyperparathyroidism

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## Question 845: A 46-year-old male presents with recurrent kidney stones. Initial workup revealed elevated serum calcium and PTH, but an ultrasound demonstrated no abnormalities of the parathyroid glands. Sestamibi scan was negative for a parathyroid adenoma on the posterior thyroid, but an ectopic adenoma was noted. Assuming the ectopic gland developed from the fourth pharyngeal pouch, where is it most likely to be found?

## Choices:

1. Tracheoesophageal groove
2. Intrathymic
3. Intrathyroid
4. Foramen cecum

## Answer: 1 - Tracheoesophageal groove

## Explanations:

- The superior parathyroid glands develop from the fourth pharyngeal pouch while the inferior parathyroid glands develop from the third pharyngeal pouch.
- The most common locations for ectopic superior parathyroid glands are the tracheoesophageal groove, retro esophageal area, or posterior mediastinum.
- The most common location for ectopic inferior parathyroid tissue is within the thymus, followed by the thyroid and anterior mediastinum.
- The final location of the inferior parathyroid glands is more variable, secondary to a prolonged descent as compared to the superior glands. These glands can end up anywhere along that descent.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Embryology, Parathyroid

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## Question 846:

A 63-year-old female presents with a rapidly growing neck mass. She has now been complaining of dysphagia and neck pain. All blood work is normal. Needle biopsy reveals malignant cells with severe dysplasia. No treatment is offered to her because the mass is rapidly growing. The patient most likely has which of the following conditions?

## Choices:

1. Follicular thyroid mass
2. Anaplastic tumor
3. Lymphoma
4. Actinomycosis

## Answer: 2 - Anaplastic tumor

## Explanations:

- Anaplastic tumors of the thyroid are rare but very aggressive.
- For the majority of patients with anaplastic thyroid cancers, there is no treatment.
- By the time of diagnosis, the tumors have spread.
- The cancers are rapidly growing and the treatment in the majority is palliative. Only a few patients are candidates for surgery and most die a slow asphyxiating death from airway compromise.

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## Research Concepts:

### Anaplastic Thyroid Cancer

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## Question 847: A 20-year-old young man presents to the clinic with complaints of cough for the past 10 days. He also reports episodic fevers associated with cough. A chest x-ray done is slightly suspicious with a well-defined patch. A clinician orders an octreotide scan, which comes back positive. What is the most likely diagnosis?

## Choices:

1. Bronchial carcinoid
2. Small cell lung cancer
3. Non-small cell lung cancer
4. Respiratory tract infection

## Answer: 4 - Respiratory tract infection

## Explanations:

- The octreotide test has a lot of factors contributing to false positive and negative results.
- False-positive tests can be caused by respiratory tract infections/ other infections, pulmonary/pleural collections after radiotherapy, recent surgical/colostomy site, tracer accumulation in normal sites (pituitary, thyroid, liver, spleen, kidneys, bowel, gallbladder, ureter, bladder, stimulated adrenals).
- False-negative results can be caused by unlabeled somatostatin present as a result of octreotide therapy/ production by the tumor, different somatostatin receptors having variable affinities for radioligands particularly insulinomas & medullary thyroid carcinomas, hepatic metastases of neuroendocrine tumors can look isointense [correlation with subtraction scintigraphy with sulfur colloid or anatomic imaging (CT/MRI) can be considered].
- The patient is quite young, with a very short history of cough and fever. Although the octreotide scan came out positive, it is more likely a false positive only due to respiratory tract infection.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Octreotide Scan

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## Question 848:

A 62-year-old woman is asking about her bone density test. She says her mother passed away at the age of 75 after sustaining a hip fracture, and she is very concerned about her fracture risk. She had menopause at the age of 52 and has no hot flashes. She does strength and aerobic exercises five times a week and does not use tobacco products. She drinks one glass of wine every night. She has no history of pregnancy. Her past medical history is unremarkable. Her medication history includes a vitamin D3 supplement (1000 UI). Vitals signs are normal. She weighs 60 kilograms. Physical examination is unremarkable. Laboratory tests show hemoglobin of 13 g/dL, creatinine 0.8 mg/dL, calcium 9.4 mg/dL, albumin 4 g/dL, thyroid-stimulating hormone 1.2 micro UI/mL, and 25-hydroxyvitamin D 37 ng/mL. Bone mineral density scan shows a T score of -1.8 for her lumbar spine and -1.5 for the femoral neck. The 10-year probability of fracture using the FRAX is 17% for a major orthopedic fracture and 1% for a hip fracture. Which of the following is the next best step in the management of this patient?

## Choices:

1. Start calcium supplements
2. Start alendronate
3. Recommend the complete cessation of alcohol
4. Increase vitamin D

## Answer: 1 - Start calcium supplements

## Explanations:

- Screening for osteoporosis by a dual-energy x-ray absorptiometry (DEXA) scan is recommended for women greater than the age of 65 and for postmenopausal women that have risk factors for osteoporosis.
- Risk factors for osteoporosis include a personal history of a fragility fracture, family history of hip fracture, current tobacco use, excessive alcohol intake (>3 drinks/day), low body weight (58 kilograms), medications (e.g., steroids, anticonvulsants), malabsorption (celiac disease), Cushing syndrome, hyperthyroidism, hyperparathyroidism, and inflammatory bowel disease.
- A T score of -2.5 on DEXA scan or a history of a fragility fracture is indicative of osteoporosis. A T score of -1 or greater is normal. A T score of -1 to -2.5 is indicative of osteopenia.
- Bisphosphonate therapy is indicated in patients with osteoporosis (T score of -2.5), or patients with low bone density with a history of a fragility fracture, or patients with osteopenia (T score of -1 to -2.5) with a 10-year fracture risk of >20 % for major orthopedic fractures or >3 % for hip fractures using the fracture-risk-assessment-tool (FRAX) calculator. This patient has osteopenia, but her fracture risk is much lower than the threshold to recommend bisphosphonate therapy. While no specific therapy is medically necessary, given her concern and an osteopenia diagnosis, a recommendation to take a calcium supplement in addition to her vitamin D would be reasonable.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Osteoporosis

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## Question 849:

A 65-year-old woman presents with a two-day history of productive cough and fever. She has a history of rheumatoid arthritis for which she has been taking prednisone for the last six months. Her temperature is 38.3 C (101 F), blood pressure is 130/90 mmHg, heart rate is 90/min, and BMI is 35. Her face is round and she has purple abdominal striae. Lung auscultation is limited due to excessive adipose tissue. A chest x-ray reveals no abnormalities. Which is the best next step in her management?

## Choices:

1. CT scan of the chest
2. Empiric therapy with amoxicillin-clavulanate
3. Sputum for culture and sensitivity
4. Discontinue prednisone

## Answer: 1 - CT scan of the chest

## Explanations:

- This patient with a history of rheumatoid arthritis has obvious signs of Cushing syndrome secondary to long-term glucocorticoid use. These patients are immunocompromised and at increased risk of pulmonary infections.
- Her two-day history of fever and productive cough raises the suspicion of a lower respiratory tract infection.
- Although her chest x-ray shows no abnormalities, a CT scan is warranted due to the high suspicion of a pulmonary infection. Chest x-rays may be normal for up to 72 hours in immunocompromised patients.
- Clinicians should have a lower threshold for ordering a chest CT scan in immunocompromised patients if a pulmonary infection is suspected. Empiric antibiotics may be prescribed after a CT scan shows some abnormalities, and sputum is collected for culture and sensitivity. Discontinuing her prednisone puts her at risk of adrenal insufficiency. It should be tapered off.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Pneumonia In An Immunocompromised Patient

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## Question 850:

An older female has routine labs drawn at the time of her physical. She has a history of hypertension and is taking hydrochlorothiazide, calcium, and vitamin D. Her physical is normal. All her labs are normal except her alkaline phosphatase is three times normal. Her gamma-glutamyl transpeptidase is normal. Which of the following is an indication for starting therapy?

## Choices:

1. Pelvic involvement
2. Alkaline phosphatase 1.5 times normal
3. Elevated serum calcium
4. Disease involving the skull

## Answer: 4 - Disease involving the skull

## Explanations:

- Skull involvement is a common indication to start therapy in Paget disease.
- Calcium levels are often normal in these patients, so therapy is not based on calcium levels.
- Initially, the treatment of Paget disease is intended to control disease activity. The long-term goals are to minimize or prevent disease progression and to decrease complications.
- Because early diagnosis and treatment are important, siblings and children of patients with Paget disease should have an alkaline phosphatase blood test every two to three years. If the alkaline phosphatase level is elevated, other tests such as a bone-specific alkaline phosphatase test, bone scan, or x-ray should be considered.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Paget Disease

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## Question 851:

A 55-year-old female presents for a routine eye check-up. She has a 5-year history of type 2 diabetes mellitus, hypertension, and hyperlipidemia. She mentions that her blood sugar is not controlled for 2 years now. The vital signs show a blood pressure of 140/90 mmHg, temperature 37.2 C (98.96 F), cardiac rate 80/min, and respiratory rate of 22 breaths/min. Her BMI is 32. The fundus examination of the eye reveals tiny, round, red dots measuring 30 micrometers temporal to the fovea. The anterior segment examination of both the eyes is within the normal limits. The laboratory exams show a fasting blood sugar level of 130 mg/dl, postprandial blood glucose is 190 mg/dl, HBA1C is 8.0 %., BUN 15 mg/dL, and creatinine of 2 mg/dL. Which of the following management will help this patient prevent further damage to his eyes?

## Choices:

1. Maintain fasting blood sugar at 110 mg/dL
2. Follow-up with a clinician every other 6 months for the management of type 2 DM
3. HBA1C maintained less than 6.5%
4. Intermittent fasting

## Answer: 3 - HBA1C maintained less than 6.5%

## Explanations:

- Diabetic retinopathy is one of the major neurovascular complications of diabetes and is a leading cause of blindness in adults of working age group.
- Chronic hyperglycemia is considered to be the primary pathogenetic agent in diabetic retinopathy.
- Patients might be asymptomatic in the early stages and might be discovered accidentally on fundus examination. As the disease progresses the following symptoms might be seen blurred vision, distorted vision, floaters, flashes, partial or total loss of vision, poor night vision, and impaired color vision in rare case scenarios. The earliest clinically detected lesions on fundal examination of the eyes are microaneurysms as seen in this patient.
- For the general control of diabetes mellitus, the HBA1C levels should be kept under 6.5 % to prevent further damage to the eyes. Lifestyle modifications like routine exercises and a proper diabetic food diet and regular follow-up every 3 months with a diabetologist is important in the management of diabetes mellitus.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Diabetic Retinopathy

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## Question 852:

A 45-year-old woman presents to the hospital with a 4-month history of a lump on her neck. The lump is moderately painful. She appears well. The examination shows swelling on the left side of her neck that moves on swallowing. Cardiopulmonary examination shows no abnormalities. Vital signs are unremarkable. Her thyroid-stimulating hormone (TSH) is 3.5 mU/mL. Ultrasound shows a 0.4 cm hypoechoic mass in the left thyroid lobe. Fine-needle aspiration of the mass shows neoplastic follicular cells. What is the most appropriate next step in management?

## Choices:

1. Chemotherapy
2. Watchful waiting
3. TSH suppression therapy
4. Thyroid lobectomy

## Answer: 4 - Thyroid lobectomy

## Explanations:

- An ultrasound showing a hypoechoic mass and fine-needle aspiration showing neoplastic follicular cells should raise concern for follicular thyroid carcinoma (FTC). Thyroid lobectomy is the most suitable next step in management for this patient, as it allows for definitive diagnosis and is the preferred first-line treatment for patients with well-differentiated intrathyroidal cancers that are less than 1 cm in size.
- Diagnosis of FTC is dependent on abnormal positioning and spread of thyroid follicles, including extracapsular and vascular invasions. Nuclear atypia itself may or may not be present, although it does indicate a worse prognosis when present. Given that individual cellular morphology is insufficient for FTC diagnosis, a fine-needle aspiration (FNA) biopsy cannot be used to diagnose FTC fully.
- FNA cannot be used to distinguish between follicular adenoma and follicular carcinoma, as it does not show whether neoplastic cells have invaded the basement membrane. This distinction is made based on the histologic analysis of the tissue following surgery.
- Watchful waiting is not appropriate in a patient with an FNA, and treatment delays may lead to cancer growth and invasion into the surrounding structures. Chemotherapy is used for cancers that are poorly differentiated. TSH suppression will be done after the surgical procedure is done.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Thyroid Cancer

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## Question 853:

A 22-year-old biological male transgender person presents to the clinic with complaints of weakness and fatigue. On further inquiry, the patient states that she had developed growth of hair on her face and body and a masculine voice, for which she had been taking an antiandrogen medication for the last 6 months. Her EKG done reveals tall T waves. Which of the following medication is this patient most likely taking?

## Choices:

1. Histrelin
2. Cyproterone
3. Estrogen and progesterone
4. Spironolactone

## Answer: 4 - Spironolactone

## Explanations:

- Androgen blockers (antiandrogens) are often used to suppress testosterone production and male secondary sexual characteristics.
- Spironolactone, a potassium-sparing diuretic, has an anti-androgen effect on testosterone production at high doses of 200 to 400 mg/day.
- Hyperkalemia is a serious side effect of spironolactone. Patients may develop polydipsia, polyuria, and orthostasis.
- If the patient is also taking an ARB or ACE-inhibitor, monitoring should be frequent.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Cultural Competence in the Care of LGBTQ Patients

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## Question 854:

A 35-year-old female patient presented to the hospital for the evaluation of chronic headaches for the past six months. The headaches had been progressively worsening. She reported peripheral visual defects on the left side for the last few months. She had amenorrheae for the previous six months. She also had weight loss with nausea and vomiting. On examination, her blood pressure was found to be 100/60 mm Hg. Magnetic resonance imaging of the head showed a suprasellar mass measuring 3x3 cm with calcification. Her lab investigations reveal sodium of 128 mEq/L. What is the next best test to explain her symptoms and sodium level?

## Choices:

1. Cosyntropin stimulation test
2. Urine osmolarity
3. Thyroid stimulation hormone
4. Prolactin levels

## Answer: 1 - Cosyntropin stimulation test

## Explanations:

- The symptoms of adrenal insufficiency are weight loss, generalized arthralgia, dizziness, and hypotension.
- Craniopharyngioma is associated with one or more hormonal deficiencies.
- Hyponatremia can be seen in a patient with adrenal insufficiency and hypothyroidism.
- Thyroid-stimulating hormone (TSH) is not reliable in a patient with pituitary disease. Free T4 is needed to have an adequate assessment of pituitary-related thyroid disorder.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Craniopharyngioma

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## Question 855: A 72-year-old male patient was referred to the surgery clinic for concerns of a 6 cm pancreatic cyst found incidentally on an MRI for evaluation of hepatic lesion. He reported occasional vague epigastric pain that radiates to the back for the last three months. His medical history is significant for hypertension, gout, diabetes mellitus, and hyperlipidemia. He takes amlodipine, atorvastatin, allopurinol, and metformin. His vitals shows blood pressure (BP): 120/98 mm/Hg, pulse rate (PR): 90 beats per minute, respiratory rate (RR): 12 breath per minute, and normal temperature. Abdominal examination is unremarkable, and bowel sounds are present. Laboratory results show creatinine 1.0 mg/dl, blood sugar: 120 mg/dl, uric acid 2.0 mg/dl, low-density lipoprotein (LDL): 120 mg/dl. He stopped smoking 20 years ago and takes alcohol occasionally. What is the next best step in the management of this patient?

## Choices:

1. Refer patient for surgical evaluation
2. Order carcinoembryonic antigen/ cancer antigen (CEA/CA) 19-9
3. No further evaluation is needed
4. Starting antibiotic therapy

## Answer: 1 - Refer patient for surgical evaluation

## Explanations:

- Pancreatic cysts are often incidentally found in patients undergoing imaging with either CT or MRI for unrelated reasons.
- Patients are typically asymptomatic; however, they can present with abdominal pain and back pain.
- Pancreatic cysts are classified as high-risk if it is symptomatic, presence of lymphadenopathy, dilated main pancreatic duct with a diameter of greater than 5 mm, and cyst characteristics suspicious for malignancy.
- Surgical resection is indicated for pancreatic cysts that are symptomatic or associated with complications such as pancreatitis or the presence of cyst features suggestive of malignancy or having the potential to be malignant.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Pancreatic Cysts

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## Question 856:

A 46-year-old man with a past medical history of diabetes presents for a follow-up. He is taking atorvastatin and metformin. He states that over the past year, he has been noticing periods of yellowing of his eyes that resolve on their own. He also notes that he had episodes with the same symptoms during his childhood. Physical exam reveals normal scleral color and an unremarkable cardiovascular, respiratory, and abdominal exam. His recent blood work shows total bilirubin of 0.9 mg/dL, AST of 16 U/L, ALT of 18 U/L, alkaline phosphatase of 48 U/L, and HbA1c of 5.4. If necessary, what changes to his medications should be made?

## Choices:

1. Stop atorvastatin
2. Stop metformin
3. Decrease the dose of metformin
4. Continue current medications on lower doses

## Answer: 1 - Stop atorvastatin

## Explanations:

- In Rotor syndrome, the proteins responsible for taking up bilirubin from the blood (OATP1B1 and OATP1B3) are abnormally short.
- There is a buildup of bilirubin in the blood leading to symptoms such as jaundice and dark urine.
- OATP1B1 also plays a role in drug detoxification, and with reduced activity of this protein, certain drugs such as anticancer agents, methotrexate, and statins can accumulate and result in drug toxicity.
- Though Rotor syndrome is a benign disease, caution should be taken before administering these drugs.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Rotor Syndrome

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## Question 857:

A 16-year-old boy is being evaluated for gynecomastia. Medical and surgical histories are normal. However, the mother noticed him more to be more wobbly during walking. On physical examination, he is alert and awake. Poor coordination is noted during a neurological examination. The pubertal examination is concerning for gynecomastia, small testes, and undersized penis. Which of the following tests is most likely to reveal the diagnosis in this patient?

## Choices:

1. Brian MRI
2. Karyotype
3. Liver function test
4. Prolactin level

## Answer: 2 - Karyotype

## Explanations:

- Poor coordination, gynecomastia, small testes, and penis are signs suggestive of Klinefelter syndrome.
- Klinefelter syndrome is diagnosed by chromosomal analysis (karyotype).
- The majority of patients with Klinefelter syndrome are diagnosed around the age of puberty.
- Low androgens and high FSH and LH levels are suggestive of Klinefelter syndrome.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Micropenis

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## Question 858:

A 46-year-old female complains of progressive fatigue, weakness, and weight gain. She has no significant past medical history. Exam shows an obese female with fat deposition at the posterior neck, face, and trunk. Purple striae are present over the abdomen. Which of the following is the most definitive test to diagnose the most likely etiology of this patients symptomatology?

## Choices:

1. 24 hour urinary free cortisol
2. Random serum cortisol
3. Serum ACTH
4. Sweat cortisol

## Answer: 1 - 24 hour urinary free cortisol

## Explanations:

- Patients with Cushing disease may have normal random serum cortisol levels. The 24 hour urinary cortisol will be increased, as this reflects cortisol secretion over a more prolonged period.
- Serum ACTH may be increased or decreased, depending on the cause of Cushing syndrome.
- Four methods are used to diagnose Cushing syndrome.
- These are urinary free cortisol level, low-dose dexamethasone suppression test, dexamethasone-corticotropin-releasing hormone test, and evening serum and salivary cortisol level.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Cushing Syndrome

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## Question 859:

A 36-year-old male patient presents to the hospital with complaints of lethargy, fatigue, joints, pain, loss of libido, and erectile dysfunction for over six months. He relates these complaints to his visit to Bangkok, where he was involved in explicit sexual activities. He has also noticed swelling in his joints and an increase in abdominal girth. On examination, he appears tanned, there is a loss of hair on the chest and pubic area, and there are spider angiomas present on the chest and upper arms. He admits drinking two to three glasses of wine every day. His fasting blood glucose is 154 mg/dL, and a complete urine examination reveals glucose 3+. Which of the following should be done to confirm the diagnosis?

## Choices:

1. Serum ceruloplasmin levels
2. ATP7B gene analysis
3. Venereal disease research laboratory (VDRL) test
4. Genetic testing for C282Y

## Answer: 4 - Genetic testing for C282Y

## Explanations:

- The most common symptom of hemochromatosis is fatigue. Other manifestations include cirrhosis, hypothyroidism, diabetes, skin pigmentation, congestive heart failure, arthropathy, and erectile dysfunction.
- The arthropathy of hemochromatosis manifests itself as joint pain without joint destruction. Although the presentation is identical to that of degenerative joint diseases, calcium pyrophosphate crystals can be found in the synovial fluid.
- Hereditary hemochromatosis occurs in homozygotes with a mutation of the hemochromatosis gene (HFE) protein. A mutation in the HFE gene causes increased absorption of iron despite a normal dietary iron intake. C282Y and H63D are the most common mutations of the HFE gene. HFE gene is present on the short arm of chromosome 6 (6p21.3).
- Further genetic testing for the mutations C282Y and H63D should be obtained in all the suspected cases of hemochromatosis. Genetic testing for these mutations will confirm the diagnosis in over 90% of cases.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hemochromatosis

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## Question 860:

A 37-year-old woman comes to the office with a history of 4-months of persistent chest burning. She also complains of recent onset of excessive urination and constipation. The epigastric pain is partially relieved by over-the-counter antacids. Her mother has a history of multiple stomach ulcers and kidney stones. She does not use alcohol, tobacco, or any over-the-counter medications. Her stool occult blood test is positive. Her initial laboratory findings include: sodium 137 mEq/L, potassium 4.5 mEq/L, chloride 104 mEq/L, bicarbonate 24 mEq/L, and calcium of 11.8 mg/dL. Which of the following is most likely to be present in this patient?

## Choices:

1. Medullary thyroid cancer
2. Carcinoma of the gallbladder
3. Primary hyperparathyroidism
4. Carcinoma of the large intestine

## Answer: 3 - Primary hyperparathyroidism

## Explanations:

- Zollinger-Ellison syndrome (ZES) is a group of symptoms comprised of severe peptic ulcer disease, gastroesophageal reflux disease (GERD), and chronic diarrhea caused by a gastrin-secreting tumor of the duodenum or pancreas (gastrinoma triangle) that results in increased stimulation of acid-secreting cells of the stomach.
- Gastrinoma causing ZES occurs sporadically in about 80% of cases. About 20 to 25% are associated with multiple endocrine neoplasia type 1 (MEN1) from various reports in the literature. Approximately 50% of patients with MEN1 have ZES; therefore, screening for MEN1 must be included in the workup of ZESs highly suspicious.
- About 25 to 30% of patients with ZES have MEN1, a group of hyperplasia and tumors of the pituitary, parathyroid, and pancreatic islet cells. Therefore, patients with ZES from MEN1 could cause hypersecretion of gastric acid from hypercalcemia. Hyperparathyroidism is present in approximately 95% of patients. Asymptomatic hypercalcemia is the most common manifestation.
- Medullary cancer of the thyroid is a component of MEN2.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Zollinger Ellison Syndrome

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## Question 861:

A 16-year-old female presented with the complaint of a large midline neck swelling. The swelling has gradually increased in size over 2 years. She also reports food getting stuck in her throat and easy fatiguability. Her vitals show a blood pressure of 130/80 mmHg and a pulse of 110 beats per minute. On physical examination, the swelling is 10x15 cm in size. There is the presence of fine tremors in both hands and bilateral proptosis. On auscultation, over the closed eye, a bruit is heard during systole. Which one of the following should be considered for the examination?

## Choices:

1. Ask the patient to move her eyes during the examination
2. Ask the patient to avoid holding her breath
3. Ask the patient to fix the gaze of her open eye on a distant object
4. Auscultation in the upright position

## Answer: 3 - Ask the patient to fix the gaze of her open eye on a distant object

## Explanations:

- Riesman's sign or Snellen-Riesman's sign is a clinical sign characterized by bruit heard over the closed eye with a stethoscope in Graves ophthalmopathy in thyrotoxicosis. The bruit is heard during systole. The examination is preferably performed in a quiet room. Both the patient and the examiner should be comfortable and relaxed. The patient is in the sitting position. Ideally, the cone-shaped long and narrow bell of the Ford-Bowles stethoscope should be used to listen to the faint sound of ocular bruit. However, the bell of the modern stethoscope is also usable. The patient should fix the gaze of their open eye of the patient on a distant object or one of the examiner's fingers. The bell of the stethoscope should be kept over the closed eye gently and firmly. The patient should not move the eyeball or eyelids during auscultation. The patient is requested to hold breath during auscultation. The contralateral carotid pulse is used to know the timing of the bruit. Valsalva maneuver may be used to accentuate the bruit.
- The Snellen Riesman's sign is due to the hyperdynamic circulation and increased cardiac output in thyroid eye disease and hyperthyroidism.
- An orbital bruit may also be heard in multiple diseases including carotid-cavernous fistula, arterial vascular malformation, stenosis of the internal carotid artery, and severe anemia.
- Goldzieher's sign denotes conjunctival congestion especially near the insertion of horizontal recti. Other important signs of Graves' ophthalmopathy include Joffroy's sign (when the patient looks up, the skin creases over the forehead are absent) and Griffith's sign (lower lid lags on down gaze).

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Riesman Sign

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## Question 862: According to recent research to reduce the occurrence of muscle cramps in patients with diabetes mellitus, the use of a dietary supplement alleviates the symptoms. What is the supplement?

## Choices:

1. L-carnitine
2. Magnesium
3. Potassium
4. B-complex vitamin

## Answer: 1 - L-carnitine

## Explanations:

- Carnitine is essential for transporting long-chain fatty acids within the mitochondrion to perform ß-oxidation, which is the major source of energy for the heart and skeletal muscles.
- Studies have shown that blood carnitine levels are low in patients with type II diabetes mellitus, as well as in patients with neuropathic pain. Taken as a 600 mg supplement, it reduces the number of muscle cramps, improving the patient's quality of life and the indices of depression and anxiety.
- Another study showed that the use of carnitine improves mood. Recent observations suggest the safe and potential use of L-carnitine as an osmotic agent, hydrating the cell and improving the systemic glucose level. If the cell is better hydrated, insulin work improves.
- Probably, carnitine allows the muscle cell to keep its functions longer, delaying the onset of cramps. Further studies are needed.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Muscle Cramps

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## Question 863:

A female with abnormal thyroid newborn screening results is evaluated on day 7 of life. She was the 7 lb 4 oz (3290-grams) product of a full-term, uncomplicated pregnancy, labor, and delivery. Mother has a history of autoimmune hypothyroidism, well-controlled with levothyroxine therapy. On physical examination at age 7 days, weight is 7 lb 5 oz (3320 grams) (50th% percentile), length 20 inches (50.8 cm) (50th percentile), and head circumference 14 inches (35.6 cm) (75th percentile). She has no goiter and no physical abnormalities. Laboratory studies show newborn screening results on day 2 of life; total T4 9 ug/dL (normal >8 ug/dL); thyroid-stimulating hormone 42 uIU/mL (normal 34 uIU/mL). Serum thyroid function tests on day 7 of life; free T4 0.8 ug/dL (0.9-2.1 ug/dL); TSH 26.4 uIU/mL (0.9-10 uIU/mL). She has a normal thyroid ultrasound. She is prescribed levothyroxine 25 micrograms by mouth daily after the confirmatory serum thyroid function test is obtained on day 7 of life. She has had a normal thyroid function test on repeat testing at each follow-up visit every 2-3 months during the first 3 years of her life. At her follow-up visit at age 3 years, she has normal growth and development. Her body weight is 15 kg (90th%). Her thyroid function test is normal while on levothyroxine 25 micrograms daily. Which of the following is the best course of action?

## Choices:

1. Continue levothyroxine therapy as she most likely has permanent hypothyroidism due to her family history of hypothyroidism
2. Order thyroid radio nuclear uptake scan
3. Check thyroid autoantibodies to evaluate for autoimmune hypothyroidism
4. Discontinue levothyroxine and repeat thyroid function test in 2 weeks

## Answer: 4 - Discontinue levothyroxine and repeat thyroid function test in 2 weeks

## Explanations:

- Congenital hypothyroidism can be permanent or transient. Permanent congenital hypothyroidism can be thyroid dysgenesis (agenesis, ectopic or hypoplastic thyroid gland) or dyshormoneogenesis (a defect of thyroid hormone biosynthesis). The transient form can be due to maternal anti-thyroid medications or maternal thyroid blocking antibodies (in mother with autoimmune thyroid disease).
- This patient is suspected of having a transient form of congenital hypothyroidism because of maternal history of autoimmune hypothyroidism, normal thyroid ultrasound, and the fact that her levothyroxine dosage has never been increased.
- Patients suspected to have a transient form of congenital hypothyroidism should have a trial off of therapy at age 3 years. The thyroid function test is normal after being off levothyroxine for 2 weeks and needs to be repeated in 1-2 months to ensure normal thyroid hormone status. Patients requiring a daily levothyroxine dose less than 2 ug/kg/day at 3 years of age have a greater likelihood of successful discontinuation of treatment.
- Thyroid radio nuclear uptake is optional at diagnosis of congenital hypothyroidism. Neonates with transient hypothyroidism due to thyroid blocking antibodies will have no uptake on the thyroid scan but have a normal or enlarged thyroid on ultrasonography. In this patient in the clinical vignette, a thyroid scan is likely normal at age 3 years because the maternal thyroid blocking antibodies have disappeared by this age. A trial of levothyroxine therapy is, therefore, the best course of action to confirm a transient nature of hypothyroidism.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Congenital Hypothyroidism

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## Question 864:

A 16-year-old female presents to the clinic with the complaints of facial twitching for the past few days. She denies any gastrointestinal or urinary symptoms. On physical exam, her vital signs reveal a blood pressure of 100/65 mmHg; heart rate 76 beats/min, temperature 98.6 degrees Fahrenheit, and a respiratory rate 23 breaths/min. She is a short, stocky young girl but otherwise healthy in appearance. Examination of her hands and feet reveal very short fourth metacarpal and metatarsal bones. Which of the following laboratory abnormalities is most likely present in this patient?

## Choices:

1. Elevated serum potassium
2. Decreased serum phosphate
3. Elevated serum magnesium
4. Decreased serum calcium

## Answer: 4 - Decreased serum calcium

## Explanations:

- Short fourth, fifth metacarpal and metatarsal bones are characteristic skeletal anomalies seen in Albright hereditary osteodystrophy, which is associated with pseudohypoparathyroidism (PHP).
- Patients with PHP typically are hypocalcemic. Hypocalcemia is responsible for the tetany-like symptoms experienced by this patient.
- PHP is characterized by normal renal function with resistance to the action of parathyroid hormone.
- PHP occurs about twice as often in females than in males.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Pseudohypoparathyroidism

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## Question 865:

A 30-year-old patient is being evaluated for progressive blurring in his vision. The funduscopy examination revealed the presence of multiple retinal hemorrhages. His blood pressure recorded at the outpatient clinic was 190/100 mm Hg. He was also found to have persistent hypokalemia. Based on these findings, what is the appropriate test to be undertaken in the patient?

## Choices:

1. Echocardiography
2. Renal doppler study
3. CT abdomen
4. CT chest

## Answer: 3 - CT abdomen

## Explanations:

- The patient already has features suggestive of malignant hypertension at an early age, associated with characteristic persistent hypokalemia.
- Primary hyperaldosteronism is mainly due to the aldosterone secreting adrenal tumors. This causes excessive retention of sodium by the kidneys, and this is compensated with the loss of potassium, thereby leading to hypokalemia.
- CT abdomen should, therefore, be done for ruling out adrenal tumors in patients presenting with hypertension alongside hypokalemia.
- Renal doppler is done for evaluating renal artery stenosis, a common cause of secondary hypertension. However, it is not associated with hypokalemia. Echocardiography helps in determining the cardiac effects of hypertension.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Primary Hyperaldosteronism

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## Question 866: A 20-year-old biological male transgender person presents to the clinic with complaints of growth of facial hair and deepening of the voice. On further inquiry, it is found that the patient identifies herself as a female. On examination, there is a growth of body hair including underarm, abdominal, and chest hair. Which of the following is the most appropriate prescription for this patient at this time?

## Choices:

1. Estrogen
2. Androgen blockers
3. Testosterone
4. Both estrogen and progesterone

## Answer: 2 - Androgen blockers

## Explanations:

- Gender-affirming hormone therapy is a common medical intervention used by transgender individuals. Such treatment allows secondary sex characteristics aligned with an individual's gender identity.
- Hormones are used to suppress male secondary sex characteristics in favor of developing female secondary sex characteristics.
- Androgen blockers (antiandrogens) are often used to suppress testosterone production and male secondary sexual characteristics.
- The effect is less reliable because the sexual characteristics that are established by puberty are typically not reversible.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Cultural Competence in the Care of LGBTQ Patients

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## Question 867: A 58-year-old female presents to the clinic for an evaluation of suspected thyroid eye disease). The patient reports a history of double binocular vision over the past three months that seems to occur more in the afternoon and evening. The patient's provider performed "routine blood tests," including thyroid function, which returned "normal." The patient has had no further workup. What laboratory and radiographic test(s) should be ordered as routine evaluation in a patient with this presentation?

## Choices:

1. Computed tomography scan head and orbits
2. Magnetic resonance imaging head and orbits
3. Anti–acetylcholine receptor (AChR) antibody (Ab) test
4. Thyroxine levels

## Answer: 1 - Computed tomography scan head and orbits

## Explanations:

- In a patient with binocular diplopia, the differential diagnosis includes myasthenia gravis, orbital myositis, chronic progressive external ophthalmoplegia, orbital tumors (primary or secondary), carotid-cavernous fistula, and any inflammatory orbitopathy (such as granulomatosis with polyangiitis).
- Orbital myositis is a clinical condition characterized by idiopathic inflammation, primarily involving the extraocular muscles. It most commonly affects patients in the third decade of life, with a female predilection. Patients typically present with moderate to severe eye or orbital pain, decreased extraocular motility, diplopia, proptosis, swollen eyelids, and conjunctival hyperemia. Visual acuity is typically spared.
- CT is the preferred method of imaging as a screening test for a patient with this differential diagnosis. MRI is typically reserved for "enhanced" imaging of specific orbital processes and brain involvement once an abnormality has been seen on CT or patient history causes expansion of the differential to include conditions better initially imaged with MRI, such as to rule out multiple sclerosis in the presence of optic neuritis.
- Laboratory testing for causes of inflammatory orbitopathy is typically not part of the initial workup unless patient history dictates it. Testing would include ANA, lysozyme, ESR, angiotensin-converting enzyme, cANCA, rheumatoid factor, RPR, and chest x-ray.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Graves Disease Orbital Decompression

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## Question 868:

A 72-year-old man with a past medical history of hypertension, type 2 diabetes mellitus, chronic kidney disease stage 2A, and multiple myeloma now in remission presents to the clinic for a 3-month follow-up. He is currently taking glimepiride, and his HbA1c three months ago was 8.2%. After a discussion, the patient is willing to try exenatide ER once weekly. He has no prior history of pancreatitis. Which of the following laboratory tests is most appropriate to be ordered before starting this medication in this patient?

## Choices:

1. Lipase level
2. Hepatitis panel
3. Lipid profile
4. Renal function tests

## Answer: 4 - Renal function tests

## Explanations:

- Exenatide is contraindicated in patients with end-stage renal disease or those that have a creatinine clearance of 30 mL/min. Renal function testing should be done to determine the patient's glomerular filtration rate and, therefore, his creatinine clearance.
- Patients who have had a previous history of pancreatitis should not be prescribed a GLP-1 receptor agonist.
- Lipase level is not recommended to be checked prior to starting a GLP-1 receptor agonist.
- Hepatitis panel and lipid profile can be done as routine tests but do not need to be done as part of a workup prior to taking a GLP-1 receptor agonist.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Compare And Contrast the Glucagon-like Peptide-1 Receptor Agonists (GLP1RAs)

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## Question 869:

A 60-year-old man presents to the clinic for a review of medications. He has been using a fentanyl patch for lumbar back pain for four years with the current dose at 75 mcg/h, as well as pregabalin 150 mg twice daily. During the course of the interview, he admits to low libido and that it has left him feeling depressed. Which of the following is the next best step in the management of this patient?

## Choices:

1. Sildenafil
2. Serum testosterone level
3. Reduce his pregabalin dosage
4. Sertraline

## Answer: 2 - Serum testosterone level

## Explanations:

- It has been recognized for some time that the chronic use of opioid medications can affect hormonal and immune function.
- Suppression of the hypothalamic-pituitary-adrenal–gonadal axis can lead to decreases in the production of testosterone, luteinizing hormone, follicle-stimulating hormone, estrogen, and cortisol. The effect is most pronounced in patients treated with intrathecal opioids.
- Gonadal suppression can lead to infertility and reduced libido, and male patients can benefit from testosterone replacement.
- Opioids can affect the immune system either through a neuroendocrine effect or by a direct action on immune cells.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Opioid-induced Endocrinopathy

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## Question 870:

A 45-year-old female presented to the clinic with complaints of breast tenderness and milky discharge from her nipples for the past two weeks. Her medical history reveals that she was being treated for hypertension, tuberculosis, and sciatica. Her last menstrual cycle was 3 weeks ago. On physical examination, there was a non-tender and diffuse enlargement of the thyroid. On breast examination, a milky yellowish discharge was seen, and breasts were tender to touch. The rest of the examination was unremarkable. Her TSH levels were increased in the thyroid function tests, while T3 and T4 levels were within the normal range. Her pregnancy test was negative. Which of the following can be the cause of her discharge, keeping in view her history?

## Choices:

1. Hypothyroidism with hypoprolactinemia
2. Hyperthyroidism with hyperprolactinemia
3. Hypothyroidism with hyperprolactinemia
4. Euthyroidism with hyperprolactinemia

## Answer: 3 - Hypothyroidism with hyperprolactinemia

## Explanations:

- Hyperprolactinemia occurs in less than 1% of the general population and 5% to 14% of patients presenting with secondary amenorrhea.
- Reproductive dysfunction and galactorrhea are the hallmarks of hyperprolactinemia.
- There is an elevated response to both thyroid-stimulating hormone and prolactin in primary hypothyroidism.
- Treatment of hyperprolactinemia depends upon the cause. Once the physiological cause of hyperprolactinemia is excluded, we should look for other possible systemic causes and address them for the symptomatic patient. In patients with hypothyroidism, levothyroxine is used to treat the pathology.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hyperprolactinemia

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## Question 871:

A 68-year-old obese female with stage IV renal disease and hyperparathyroidism presents to her orthopedist with right elbow pain. The patient reports stumbling on her cat after awakening to use the bathroom two nights ago. She was able to catch herself on the sink, but hit her elbow "pretty good." She also states that she has had "months of muscle and bone aches" that "come and go." The patient was recently hospitalized and treated for sepsis secondary to a urinary tract infection associated with nephrolithiasis, where she was found to have hypocalcemia, hyperphosphatemia, hyperparathyroidism, and elevated alkaline phosphatase. Physical exam reveals ecchymosis over the volar aspect of her proximal antebrachium. The elbow is diffusely tender to palpation, but an active range of motion is not limited. The patient is neurovascularly intact in her upper extremities. Radiographic evaluation reveals no acute fracture. Incidentally, a multilocular "soap-bubble" radiolucent lesion is noted in the distal third of her right radius. What would a histological examination of this lesion demonstrate?

## Choices:

1. Thinned trabecular bone resorption
2. Thickened trabecular bone formation
3. Thinned trabecular bone formation
4. Thickened trabecular bone resorption

## Answer: 1 - Thinned trabecular bone resorption

## Explanations:

- The patient's clinical condition is consistent with a brown tumor secondary to her renal osteodystrophy. Renal osteodystrophy is a spectrum of sequelae from chronic kidney disease that manifests as abnormalities of bone metabolism or mineralization due to endocrine or electrolyte abnormalities. Patients typically have hypocalcemia, hyperphosphatemia, elevated alkaline phosphatase, and elevated parathyroid hormone levels. Brown tumors are a rare, local manifestation of renal osteodystrophy and secondary hyperparathyroidism that predispose patients to pathological fractures. Treatment is focused on managing the underlying renal disease, controlling the electrolyte and metabolic abnormalities. Renal transplant is the ultimate treatment modality for renal osteodystrophy in patients with end-stage renal disease (ESRD).
- Presenting symptoms typical of renal osteodystrophy are similar to those associated with hypocalcemia and hyperparathyroidism. The continuous elevation of parathyroid hormone stimulates bone resorption. The mechanism is thought to result from the modulation of the parathyroid hormone 1 receptor (PTH1R). Increased receptor activator of nuclear factor kappa-B ligand (RANKL) synthesis and inhibition of osteoprotegerin (OPG) lead to osteoclast proliferation and survival, with osteoblast apoptosis, which results in a net-catabolic state of bone reflecting bone resorption more than bone formation.
- Radiolucent lesions on radiographs are associated with "bone resorption," increased osteoclast activity, and apoptosis of osteoblasts. More specifically, brown tumors have an increase in giant cells and are often misdiagnosed as giant cell tumors. The acute elbow pain is a distractor in the question but enables the discovery of an "incidental" finding. Brown tumors can be thought of as more localized osteitis fibrosa associated with ESRD. The lesions are usually hypervascular.
- The differential diagnosis for osteolytic lesions includes but is not limited to metastasis, myeloma, osteomyelitis, fibrous dysplasia, osteoblastoma, enchondroma, aneurysmal bone cyst, unicameral bone cyst, giant cell tumor, brown tumor.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Histology, Osteoblasts

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## Question 872:

A 62-year-old woman is in the hospital after undergoing knee replacement surgery. Heparin is started as a prophylaxis for deep vein thrombosis. After five days, she suddenly develops a hypotensive episode, and her blood pressure measurement is 80/50 mm Hg. Other vitals and systemic examination are unremarkable except the abdominal tenderness. A bolus of fluid is given, but it doesn't raise her blood pressure. She is then started on norepinephrine infusion along with normal intravenous saline. Blood investigations show hemoglobin of 10.4 gm/dl, total leukocyte count of 7,000/mm3 with a differential count of neutrophil 62%, lymphocyte 28%, monocyte 02%, eosinophil 08% and platelet count of 80,000/mm3. Blood chemistry reveals glucose of 62 mg/dl, urea of 35 mg/dl, creatinine of 1.7 mg/dl, sodium of 131 mg/dl, and potassium of 5.7 mg/dl. Complete blood count at the time of admission showed hemoglobin 12 gm/dl, total leukocyte count 7,200 with a differential count of neutrophil 64%, lymphocyte 30%, monocyte 03%, eosinophil 03% and platelet count of 200,000/mm3. Blood chemistries were also within normal limits. Heparin is discontinued. Which of the following would be the most important to maintain her blood pressure?

## Choices:

1. Dopamine infusion
2. Glucocorticoid infusion
3. Intravenous antibiotics
4. Intravenous colloids

## Answer: 2 - Glucocorticoid infusion

## Explanations:

- This 42-year-old female who was receiving heparin for deep vein thrombosis suddenly develops a hypotensive episode with a drop in hemoglobin and decreased platelet count. This suggests she developed heparin-induced thrombocytopenia and has some occult hemorrhage as well. She has abdominal tenderness, eosinophilia, low blood glucose, hyponatremia, hyperkalemia, and pre-renal azotemia, pointing toward an adrenal hemorrhage.
- Glucocorticoid administration needs to be started as soon as possible to address the adrenal insufficiency that she developed due to the adrenal hemorrhage.
- Although adrenal hemorrhage is classically described in association with meningococcemia, there are numerous etiologies, including heparin-associated thrombocytopenia.
- CT abdomen is the investigation of choice to assess for adrenal hemorrhage.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Waterhouse-Friderichsen Syndrome

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## Question 873:

A 52-year-old woman presents with increased thirst, diarrhea, weight loss, and abdominal pain following meals. She has a body mass index (BMI) of 20 kg/m2, no past medical history, and takes no medications. Blood results show thyroid-stimulating hormone TSH 0.001 mU/L (0.5-5), T3 0.2 ng/dL (0.7-1.5), growth hormone 1 ng/mL (0-5) and glucose 150 mg/dL (65-110). Which of the following cell types releases the hormone that led to these symptoms and lab findings?

## Choices:

1. Alpha cells
2. Beta cells
3. Delta cells
4. G cells

## Answer: 3 - Delta cells

## Explanations:

- The symptoms and the lab work are congruent with excess somatostatin production, which is released from delta cells within the pancreas. Somatostatin has a global inhibiting effect, which decreases TSH, T3, growth hormone, and insulin.
- Increased thirst results from hyperglycemia. This develops due to somatostatin's inhibition of insulin. Diarrhea and weight loss develop due to malabsorption, which also results from excess somatostatin.
- Somatostatin inhibits cholecystokinin, which leads to the development of gall stones and abdominal pain following meals.
- Alpha cells produce glucagon, beta cells produce insulin, and G cells produce gastrin. G cells are located in the stomach, while alpha, beta, and delta cells are located in the islets of Langerhans within the pancreas.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Physiology, Somatostatin

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## Question 874:

A 45-year-old woman G0 who is now deceased was diagnosed with primary ovarian insufficiency when she was 31-years-old. She was never started on hormone replacement therapy. Which one of the following comorbidities of primary ovarian insufficiency most likely caused her untimely death?

## Choices:

1. Depression leading to suicide
2. Cardiovascular disease leading to myocardial infarction
3. Osteoporosis leading to hip fracture and fall
4. Diabetes mellitus leading to renal failure

## Answer: 2 - Cardiovascular disease leading to myocardial infarction

## Explanations:

- Low levels of estrogen associated with primary ovarian insufficiency lead to infertility and sexual dysfunction which can affect a woman's psyche, increased bone resorption leading to decreased bone mineral density, and is associated with autoimmune diseases such as diabetes mellitus. The mortality of women with primary ovarian insufficiency, however, is most significantly impacted by hypoestrogenic changes to the cardiovascular system.
- Cardiovascular disease remains the most significant contributor to morbidity and early mortality in women that have primary ovarian insufficiency.
- Decreased levels of estrogen have been associated with endothelial dysfunction and abnormal lipid profiles which can increase the risk for cardiovascular ischemic events up to 80%.
- After the diagnosis of primary ovarian insufficiency is made, it is important for hormone replacement therapy to replete estradiol levels to 100 pg/mL daily to decrease cardiovascular morbidity and mortality.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Primary Ovarian Insufficiency

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## Question 875:

A 30-year-old woman who is a bodybuilder presents with weight loss, palpitations, and heat intolerance. She has no past medical history. She mentions she takes dietary supplements to help her with her performance in an upcoming competition. Her vital signs show oxygen saturation 98% on room air, respiratory rate 16 per minute, heart rate 105 bpm and regular, blood pressure 124/85 mmHg, and temperature 98.2 F. On cardiac auscultation, there is no murmur. Blood tests show thyroid-stimulating hormone (TSH) 0.5 mIU/L (0.5-5). Which of the following is most likely responsible for this patient's presentation?

## Choices:

1. Chronic iodine excess causing elevated thyroid-stimulating hormone levels which inhibits thyroid hormone production leading to hypothyroidism and goiter
2. She has been intentionally abusing levothyroxine in hopes to gain weight
3. Recently started dietary supplements leading to iodine excess and iodine-induced hyperthyroidism
4. She may be pregnant and pregnancy causes iodine excess

## Answer: 3 - Recently started dietary supplements leading to iodine excess and iodine-induced hyperthyroidism

## Explanations:

- This patient is most likely experiencing iodine-induced hyperthyroidism.
- Iodine toxicity is most commonly caused by over-consumption of dietary supplements.
- Foods containing iodine include iodized salt, drinking water, milk, certain seafood, and seaweeds.
- Iodine deficiency in pregnancy leads to hypothyroidism and impaired infant neurobehavioral development.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Iodine Toxicity

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## Question 876: A female presents with a neck mass but has no other symptoms. Examination reveals a 2 x 2 cm hard mass. A nuclear scan reveals a cold mass. What is the most likely diagnosis?

## Choices:

1. Hashimoto thyroiditis
2. Adenoma
3. Nodular goiter
4. Thyroglossal duct cyst

## Answer: 2 - Adenoma

## Explanations:

- Eighty percent of cold thyroid nodules are benign.
- Only 20% of cold nodules are malignant or adenomas.
- Almost all thyroid adenomas are follicular adenomas. Follicular adenomas are "cold", "warm," or "hot" depending on their level of function. Histopathologically, follicular adenomas can be classified according to their cellular architecture, cellularity, and colloid into six types: (1) fetal (microfollicular) which has small, closely packed follicles lined with epithelium; (2) colloid (macrofollicular) which does not have the potential for microinvasion; (3) embryonal (atypical) which has the potential for microinvasion; (4) Hurthle cell adenoma (oxyphil or oncocytic tumor) which has the potential for microinvasion; (5) hyalinizing trabecular adenoma; and (6) papillary adenomas which are very rare.
- A thyroid adenoma may be silent ("cold" or "warm") or it may be a functional tumor, producing thyroid hormone ("hot"). In this case, it may result in symptomatic hyperthyroidism, and it is a known as a toxic thyroid adenoma. Most patients with thyroid adenoma can be managed by watchful monitoring for changes in nodule size and symptoms and repeat ultrasonography or needle aspiration biopsy.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Thyroid Adenoma

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## Question 877:

A 30-year old man presents to the clinic with the blurring of vision in both eyes for 15 days. A history of redness is present for 2 months. The patient takes carbimazole for one year in view of hyperthyroidism. He has a history of diabetes mellitus for the last 2 years. On ophthalmic examination, best-corrected visual acuity is 20/40 in both eyes. Mild conjunctival congestion is observed in both eyes. Fundoscopy reveals a normal optic disc. Pupillary examination reveals no relative afferent pupillary defect in either eye. Which of the following is the next best step in the management of this patient?

## Choices:

1. Topical lubricant
2. Color vision and contrast sensitivity testing
3. Oral prednisone
4. Reassurance

## Answer: 2 - Color vision and contrast sensitivity testing

## Explanations:

- In a suspected case of bilateral dysthyroid optic neuropathy (DON), it is crucial to carry out the color vision and contrast sensitivity tests since an early-onset DON may only have an impaired color vision and contrast sensitivity as the presenting features. The fundus is often normal in the early stages.
- Bilateral symmetric pathology may reveal normal pupillary examination because there will be no relative afferent pupillary defect in this case.
- Other investigations like visual evoked potential, optical coherence tomography and color doppler imaging may also be carried out but these aren't available everywhere and are expensive.
- The patient is a known case of diabetes mellitus. No form of corticosteroid therapy must be initiated without carrying out baseline investigations such as blood sugar levels, chest x-ray, electrocardiography, or liver function tests.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Dysthyroid Optic Neuropathy

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## Question 878:

A 38-year-old woman presents to the clinic complaining of spontaneous galactorrhea. The patient has a history notable for severe claustrophobia. The review of systems is unremarkable. Visual fields and cranial nerves are intact. Her serum prolactin level is 177 ng/mL (normal range: 2 – 29 ng/mL) and urine HCG is negative. What is the next best step in the evaluation of this patient?

## Choices:

1. CT sella protocol with intravenous contrast
2. CT sella protocol without intravenous contrast
3. CT angiogram of the head
4. Radionuclide cisternography

## Answer: 1 - CT sella protocol with intravenous contrast

## Explanations:

- A dedicated MRI protocol with and without intravenous contrast is the first-line choice for evaluating for a functional pituitary microadenoma. However, if patients have absolute contraindications to MRI (claustrophobia, a noncompatible pacemaker or metallic foreign body), a CT with intravenous contrast may be obtained.
- Noncontrast CT imaging of the pituitary adds little diagnostic value. This repeat imaging increases the patient's radiation dose without clinical benefit. This is even more relevant to newer CT scanners, which can generate virtual noncontrast images without any added radiation dose to the patient.
- A CTA head with intravenous contrast is an ideal study to evaluate for vascular regions within the head. However, this is not a recommended imaging study for the initial evaluation of possible pituitary microadenoma.
- Radionuclide cisternography is not indicated for the evaluation of pituitary adenomas.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Pituitary Gland Imaging

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## Question 879:

A 16-year-old male was admitted to the hospital with complaints of increased thirst, increased urination, increased hunger, fatigue, and weight loss. A blood test done detects hemoglobin A1c of 11.5%. Upon further inquiry, he has no significant past medical history. His weight is 66 kg, and his height is 1.55 m (61"). After the initial evaluation, the medical team wants to start the patient on a basal/bolus insulin regimen. Which of the following regimens are most likely to be recommended?

## Choices:

1. Insulin glargine 33 units daily plus insulin aspart 15 units TID AC
2. Insulin detemir 15 units daily plus insulin aspart 5 units TID AC
3. Insulin glargine 20 units daily plus insulin aspart correctional scale only 4 times daily
4. Insulin detemir 10 units daily plus insulin aspart 10 units TID AC

## Answer: 2 - Insulin detemir 15 units daily plus insulin aspart 5 units TID AC

## Explanations:

- Starting insulin doses for newly diagnosed type 1 diabetes patients are 0.4 to 1 units/kg/day. This dose is divided into 50% basal insulin (insulin glargine or detemir) plus 50% rapid-acting insulin given in 3 divided doses with meals (insulin aspart, glulisine, or lispro).
- Type 1 patients need complete insulin replacement and are not candidates for oral diabetes medications.
- Insulin aspart is dosed with meals, 15 minutes before starting the meal, up to 3 times daily.
- If a meal is skipped, skip the insulin aspart to prevent hypoglycemia.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Aspart Insulin

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## Question 880:

A 45-year-old man with a history of hypertriglyceridemia and heartburn presents to the clinic for a routine check-up. The patient states that he is now doing routine physical exercises and started to eat a healthy diet. The patient's laboratory lipid panel evaluation still shows a triglyceride level of 520 mg/dL, indicating no improvement from the last visit. Vital signs reveal a blood pressure of 104/66 mmHg, heart rate of 64/min, respiratory rate of 12/min, and a temperature of 37 C. The patient currently is taking omeprazole for heartburn. The clinician prescribes icosapent ethyl, a type of omega 3 fatty acid supplement that only contains an ethyl ester of eicosapentaenoic acid (EPA), to reduce his triglycerides before starting a routine cholesterol medication. Which of the following is the most appropriate method to improve the effectiveness of the EPA supplement?

## Choices:

1. Crush and chew the capsule
2. Take the EPA supplement with meals
3. Schedule the dosing of the EPA supplement to be taken hours apart from the omeprazole
4. Avoid consuming grapefruit close to the EPA supplement

## Answer: 2 - Take the EPA supplement with meals

## Explanations:

- Omega-3-acid ethyl esters, omega-3-carboxylic acids, and omega-3-acid ethyl esters A are approved for adults (18+ years of age) with very high triglycerides (500 mg/dL) as an adjunct to diet to decrease triglyceride levels and reduce cardiovascular events.
- EPA exclusive supplements have shown to have no drug-drug interactions with other medications that may use the P450 metabolic pathway. Omeprazole, warfarin, atorvastatin, and rosiglitazone have been shown to have no issue when taken together with these drugs.
- All OM3FA supplements should be taken whole without being crushed, chewed, or dissolved in the mouth.
- Icosapent ethyl is administered as capsules with a daily dose of 4 g/day that are taken as two 2 gram capsules twice a day with meals.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Omega-3 Fatty Acids

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## Question 881: A 16-year-old girl with no known past medical history presents to the hospital with complaints of headache, palpitations, and diaphoresis. She is found to be hypertensive. MRI of the abdomen and pelvis reveals no masses. 2D-echocardiogram reveals a 9 cm pericardial mass. A rare form of a primary cardiac tumor is suspected, which is confirmed with laboratory investigations. Which of the following is the most likely diagnosis?

## Choices:

1. Multiple endocrine neoplasia (MEN)
2. Insulinoma
3. Carcinoid tumor
4. Rett syndrome

## Answer: 1 - Multiple endocrine neoplasia (MEN)

## Explanations:

- Cardiac pheochromocytomas can be associated with multiple endocrine neoplasia type 2 (RET gene), neurofibromatosis 1 (NF1), gastrointestinal stromal tumors, Von Hippel-Lindau disease (VHL gene), adrenocortical adenoma, and/or endocrine tumors, such as in Carney triad and paraganglioma syndromes type 1, 3, and 4 (SDH gene).
- Cardiac pheochromocytomas (CP) are a type of extra-adrenal pheochromocytomas, and in most cases, they are benign.
- If associated with one of the above-mentioned genetic diseases, especially in young patients, genetic counseling is warranted.
- None of the other listed conditions would give this constellation of symptoms.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Cardiac Chromaffin Cell Pheochromocytoma

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## Question 882: A 45-year-old female reports a 10 kg weight gain over 18 months, abdominal stretch marks, and facial acne. The patient is hypertensive and hyperglycemic. 24-hour free urine cortisol is elevated. Low dose dexamethasone suppression test is negative, but high dose test is positive. Where is the tumor?

## Choices:

1. Anterior pituitary
2. Lung
3. Adrenal cortex
4. Ovary

## Answer: 1 - Anterior pituitary

## Explanations:

- The patient has Cushing syndrome as evidenced by physical exam and labs.
- The fact that it took high dose dexamethasone to suppress cortisol indicated overproduction of adrenocorticotropic hormone (ACTH) by the anterior pituitary.
- The actual incidence and prevalence of Cushing syndrome are not known. The prevalence of the disease is highly variable across different ethnic and cultural groups depending upon the frequency and spectrum of the medical conditions requiring steroid based therapy.
- The best therapy in iatrogenic Cushing syndrome is to taper off the steroids slowly. Cushing disease is best treated with transsphenoidal surgical resection of pituitary adenoma. Adrenal adenomas, adrenal carcinomas, and ACTH-secreting ectopic sources are surgically resected. Postoperative mitotane is given in the case of adrenal carcinoma. Ketoconazole, metyrapone, and mifepristone are given in selected cases.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Cushing Syndrome

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## Question 883:

A 45-year-old man with diabetes has recently started an aerobic exercise routine. He has followed the American Heart Association guidelines and performed 75 minutes per week of vigorous-intensity aerobic exercise. He has not changed any of his medications or diet and has noticed a decrease in his morning fasting blood sugar from 120 to 105 mg/dL. Which of the following best explains the mechanism responsible for this change at the level of the skeletal muscle?

## Choices:

1. Increased insulin production from muscle cells
2. Decrease in glucose uptake at the level of the muscle cells
3. Increased density of GLUT-4 within the muscle cell membrane
4. Decreased breakdown of glycogen within the muscle cell

## Answer: 3 - Increased density of GLUT-4 within the muscle cell membrane

## Explanations:

- GLUT4 is an insulin-stimulated transporter protein responsible for glucose uptake in muscle cells. Increased GLUT-4 leads to increase glucose uptake within the muscle.
- Aerobic exercise has been linked to more production of AMP-activated protein kinase (AMPK) - a sign transducer involved in glucose uptake in skeletal muscle, possibly through increased GLUT4 translocation to the cell membrane.
- Moderate aerobic training at 70-75% of VO2 max for 1 hour may increase GLUT4 concentrations in as little as one week and lead to improved glucose uptake.
- Insulin stimulates muscle cells to absorb glucose and store it in the form of glycogen. During exercise, there is increased insulin sensitivity leading to improved glucose uptake.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Normal Versus Chronic Adaptations To Aerobic Exercise

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## Question 884: A 45-year-old patient with insulin-dependent diabetes mellitus has a plantar foot ulcer that develops an infection. Which organism is most likely to be found on culture?

## Choices:

1. Staphylococcus aureus
2. Streptococcus
3. Clostridium perfringens
4. Enterococcus

## Answer: 1 - Staphylococcus aureus

## Explanations:

- Staphylococcus aureus is the most commonly cultured organism in diabetic foot infections.
- However, as the depth and severity of infection increases, these quickly become polymicrobial.
- Reasonable choices for outpatient antibiotics include standard skin and soft tissue coverage such as doxycycline and trimethoprim/sulfamethoxazole.
- Once the infection spreads to the deep tissues or becomes limb threatening, antimicrobial coverage should be broadened to include gram-negative organisms and anaerobes.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Diabetic Foot Infections

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## Question 885:

A 76-year-old man comes to the office for a routine follow-up visit. He was diagnosed with type 2 diabetes mellitus 10 years ago, managed appropriately with dietary modifications and metformin. Medical history is also notable for chronic kidney disease and hypertension, for which he takes lisinopril, aspirin, and atorvastatin. Family history is significant for type 2 diabetes mellitus in both parents. He occasionally drinks alcohol but does not use tobacco or illicit drugs. His temperature is 37.1 C (98.8 F), blood pressure is 155/92 mm Hg, pulse is 79/min, respirations are 14/min, and his BMI is 35 kg/m2. Laboratory results confirm optimal glycemic control, but his estimated glomerular filtration rate (eGFR) has fallen to 43 ml/min/1.73 m2 from 50 ml/min/1.73 m2 6 months ago. Which of the following actions is the most appropriate in his management?

## Choices:

1. Discontinue metformin for the fear of side-effects due to worsened renal function
2. Continue metformin, but with increased monitoring of renal function, and with possible dose reduction
3. Continue metformin because it is the oral hypoglycemic drug-of-choice in patients with renal failure
4. Discontinue metformin because it is no longer considered first-line in the elderly

## Answer: 2 - Continue metformin, but with increased monitoring of renal function, and with possible dose reduction

## Explanations:

- Metformin, a biguanide, upregulates adenosine monophosphate-activated protein kinase activity, and inhibits mitochondrial glycerophosphate dehydrogenase. The combined effect is reduced hepatic gluconeogenesis and lipogenesis, as well as increased insulin-mediated uptake of glucose in muscles (ie, reduced insulin resistance).
- The common side effects of metformin include gastrointestinal upset, such as diarrhea (12% to 53%), nausea and vomiting (7% to 26%), and flatulence (4% to 12%), chest discomfort, flushing, headache (5% to 6%), dizziness, disordered taste, and vitamin B12 deficiency. However, an uncommon, yet the most feared side-effect is lactic acidosis, which mainly occurs in patients with a predisposition to hypoperfusion and hypoxemia, such as severe renal dysfunction (eGFR less than 30 mL/minute/1.73 m2), hemodynamic instability from causes such as heart failure or sepsis, and past history of lactic acidosis with metformin.
- Metformin is absolutely contraindicated in patients with an eGFR less than 30 ml/min/1.73 m2, whereas the initiation of metformin is not recommended if the eGFR is between 30 and 45 ml/min/m2. However, if a patient is taking metformin and his renal function slides below 45 ml/min/1.73 m2, it is generally advised to continue taking metformin, but with increased monitoring of eGFR, possible dose reduction by half (not more than 1000 mg/day), and patient education to stop usage for nausea, vomiting, or dehydration.
- Besides the relatively safer side-effect profile as compared to other oral hypoglycemic medications, it also has a perceived benefit of weight loss (or neutral) in patients with type 2 diabetes mellitus, and the risk of associated hypoglycemia is also comparatively low. Due to these reasons, it is usually included in the first-line pharmacotherapy, and most-often the initial drug-of-choice, in the management of type 2 diabetes mellitus in most patients.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Oral Hypoglycemic Medications

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## Question 886:

A 28-year-old woman comes to the hospital complaining of amenorrhoea for the last three months, along with a 6 lb (2.7 kg) unintentional weight loss. She has been trying to get pregnant for the last three months, but home pregnancy tests have been persistently negative for the last few months. She also complains of diarrhea, excess sweating, and palpitations, which she believes is due to her stress of not being able to conceive. She has no past medical history, and her only medications are prenatal folate and iron supplements. She is found to have excess serum free T3 and free T4 with minimal serum TSH levels and elevated TSH receptor antibodies (TRAb). She is started on anti-thyroid drugs, and scheduled for follow-up visits. If she gets pregnant during this treatment, how will her therapy be modified?

## Choices:

1. Thiamazole will be switched to propylthiouracil in the first trimester.
2. Propylthiouracil will be switched to methimazole for the second trimester.
3. Methimazole can be continued during the course of pregnancy.
4. Switch anti-thyroid drugs to radio-active iodine therapy.

## Answer: 1 - Thiamazole will be switched to propylthiouracil in the first trimester.

## Explanations:

- The patient presenting with weight loss, diarrhea, amenorrhoea, sweating, palpitations, and inability to conceive represents a hyperthyroid state. This is later confirmed in investigations as well. The patient is started on anti-thyroid medications for the same.
- Since the patient is trying to get pregnant, she requires strict follow-up. Thiamazole is better than propylthiouracil in terms of efficacy, has fewer side effects, longer half-life, and is a good choice to start therapy.
- But if she gets pregnant, then it will have to be switched to propylthiouracil as thiamazole is contra-indicated in the first trimester of pregnancy.
- Methimazole cannot be continued throughout pregnancy due to the reason above. RAI is contraindicated for use during pregnancy as well.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Diffuse Toxic Goiter

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## Question 887:

A 65-year-old male with a past medical history of chronic kidney disease, congestive heart failure, and type 2 diabetes mellitus presents to the clinic to establish care. The patient currently manages his diabetes mellitus with only metformin but his hemoglobin A1C is 9.2% today. The patient requires adding a second oral agent to manage his diabetes but the patient is unsure about which stage of chronic kidney disease he is currently at. Which of the following is a contraindication for starting this patient on a sodium-glucose cotransporter-2 inhibitor?

## Choices:

1. Glomerular filtration rate less than 60 L/min
2. Glomerular filtration rate less than 45 L/min
3. Glomerular filtration rate less than 30 L/min
4. Hemoglobin A1C above 9.0%

## Answer: 3 - Glomerular filtration rate less than 30 L/min

## Explanations:

- In 2016, the US Food and Drug Administration (FDA) approved a new indication for empagliflozin, which was to reduce the risk of cardiovascular death in adult patients with type 2 diabetes mellitus and cardiovascular disease. Its use is contraindicated in patients whose glomerular filtration rate (GFR) is less than 30 L/min.
- By inhibiting sodium-glucose cotransporter-2 (SGLT-2), empagliflozin reduces renal reabsorption of glucose and increases urinary glucose excretion. In patients with type 2 diabetes mellitus, urinary glucose excretion increases at approximately 64 grams/day with 10 mg of empagliflozin and 78 grams/day with 25 mg.
- Empagliflozin is associated with ketoacidosis, particularly in patients with type 1 diabetes mellitus, which is why it is not used in these patients.
- Empagliflozin increases the risk of genital mycotic infections and urinary tract infections. Evaluate for signs and symptoms and treat appropriately.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Empagliflozin

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## Question 888:

A 65-year-old male patient was admitted with complaints of chest tightness. Further evaluation with EKG and troponin were unremarkable. Vital signs and physical examinations were normal. A CT angiogram of the chest was done to rule out pulmonary embolism, which revealed an anterior mediastinal mass measuring 4.5 cm in the greatest dimension. Thoracoscopic tumor resection was performed. The microscopic evaluation of the specimen was notable for the close margins of the resected tumor. What is the best course of management for this patient?

## Choices:

1. Surgery
2. Chemotherapy
3. Radiation
4. No further therapy, just wait and watch

## Answer: 3 - Radiation

## Explanations:

- The majority of carcinoids in the mediastinum occur in the thymus. Most patients present with a heaviness in the chest area, and carcinoid syndrome is sporadic. The patients are usually in the 5-6 decade of life, and cancer is more common in males compared to females. Surgery is the mainstay of treatment that gives a chance for cure. Therefore complete resection should always be attempted. Induction chemotherapy is usually administered in advanced neoplasms, or locally advanced disease to achieve tumor shrinkage, increasing, thus, the chance to obtain a complete resection, unfortunately, results are variable. Radiation is the treatment of choice for resected tumors with a positive or close margin.
- Induction chemotherapy is usually administered in advanced neoplasms, or in locally advanced disease to achieve tumor shrinkage, increasing, therefore, the chance to obtain a complete resection. Chemotherapy, in this case, has no role as it is localized and was resected.
- Postoperative radiotherapy is administered in case of invasive lesions, or incomplete resections. As this patient has a margin, positive radiation is indicated.
- Non-functioning carcinoids may be linked to MEN 1 and can be large lesions. They are hard to differentiate from a thymoma. However, most carry a poor prognosis as even after surgery, recurrence is frequent.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Mediastinal Carcinoid Tumors

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## Question 889:

A 56-year-old man presents for a health maintenance visit. He has a past medical history of hypertension, hyperlipidemia, and type 2 diabetes. His current medications include lisinopril, atorvastatin, aspirin, pioglitazone, and glimepiride. He admits to compliance with his medications. A hemoglobin A1c is performed in the office, and the result is 8.7%. The physician desires to add insulin glargine in order to help the patient achieve better glycemic control. What is the most worrisome adverse effect to be concerned about in this patient if he remains on his current home medications once insulin glargine is added?

## Choices:

1. Myalgias
2. Hyperglycemia
3. Acute kidney injury
4. Dose-related fluid retention

## Answer: 4 - Dose-related fluid retention

## Explanations:

- When insulin is administered with a thiazolidinedione, there is an increased risk for dose-related fluid retention.
- Adding insulin glargine to this patient's regimen is appropriate because the patient's diabetes was not well controlled on his current regimen of two antidiabetic medications.
- The goal of hemoglobin A1c in most patients is less than 7%. However, this is patient-specific and a higher goal may be acceptable for some.
- Another adverse effect that can occur with insulin glargine unrelated to coadministration with other medications is hypoglycemia. The patient must be educated on how to recognize and treat hypoglycemia as well as how to administer medications properly.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Glargine Insulin

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## Question 890:

A 68-years-old female with no significant past medical history presents with a 2-week history of fatigue, low energy, thirst, and increased urination. She also complains of bone pain, which she attributed to fall on outstretched hand three days ago. She is not taking any medications other than multiple over the counter vitamin D supplements to "cure her bone pains". Her vitals are within normal limits. A physical exam is consistent with dry mucous membranes and is otherwise unremarkable. Her laboratory values show hemoglobin 7.8g/dL, calcium level 14 mg/dL, and creatinine 2.1 mg/dl, which is new from her baseline. She has an X-ray of her upper arms done due to a history of fall, which revealed a lytic lesion in the head of her humerus. What is the most likely next step in her management after starting intravenous hydration?

## Choices:

1. Send vitamin D level to rule out vitamin D toxicity
2. Send for alkaline phosphatase to rule out Paget disease
3. Hydration and high dose vitamin D supplements.
4. Work up the patient for possible multiple myeloma.

## Answer: 4 - Work up the patient for possible multiple myeloma.

## Explanations:

- Her symptoms of hypercalcemia, renal dysfunction, anemia, and bone pain, along with the presence of a lytic lesion, are highly suspicious for multiple myeloma. Vitamin D toxicity does not cause lytic lesions on X-ray and anemia.
- In the setting of hypercalcemia, she should not continue on vitamin D supplements at this point. She should be hydrated. Sending vitamin D level would be a good step, but her risk factors point towards the possibility of multiple myeloma.
- Trauma is an unlikely explanation for her lytic lesion. The other risk factors point towards a pathological cause. Multiple myeloma (MM) is a clonal plasma cell proliferative disorder characterized by the abnormal increase of monoclonal paraprotein leading to evidence of specific end-organ damage. Usually, the patient is an older adult complaining of constitutional symptoms such as fatigue, weight loss, and bone pain, particularly in the back and chest.
- Paget disease is a focal disorder of bone metabolism and often leads to osteolytic, osteoblastic, or mixed lesions on imaging. It can cause bone pain and fractures, but anemia and renal injury are uncommon. Labs show a significant elevation of alkaline phosphatase levels and normal or minimally elevated calcium levels.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Vitamin D Toxicity

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## Question 891:

A 7-year-old female came in with complaints of severe left forearm pain. The patient and her parents denied any trauma. On physical examination, there are multiple bony deformities of upper and lower limbs, hyperpigmented macules on back and buttocks bilaterally. Her past medical history is significant for hyperthyroidism for which she is taking radio-iodine therapy. X-rays of the lower limbs show scar-like fibrous tissues in the bone. Her blood pressure is 130/90 mm Hg, temperature is afebrile, and pulse is 90 bpm. What is the most common type of autonomous endocrine hyperfunction in these patients?

## Choices:

1. Diabetes mellitus
2. Multinodular goiter
3. Precocious puberty
4. Gigantism

## Answer: 3 - Precocious puberty

## Explanations:

- McCune-Albright syndrome is a rare genetic disordered originally recognized by the triad of polyostotic fibrous dysplasia, precocious puberty, and café-au-lait spots. A variety of endocrine disorders, including hyperthyroidism, acromegaly, phosphate wasting, and Cushing syndrome are now considered as part of the endocrinopathies seen in this disorder. The most common form of autonomous endocrine hyperfunction in patients with McCune-Albright syndrome is precocious puberty.
- This is due to the excess release of androgens and other sex hormones. Patients with McCune-Albright syndrome are more likely to experience stress fractures that may lead to permanent deformity if not stabilized. CT scan of the skull helps in the diagnosis of craniofacial bone lesions and pituitary lesions. Regular vision and hearing tests can monitor lesions affecting those systems. A baseline bone scan with 99Tc-methyl diphosphate is indicated in endocrinopathies that affect bone development.
- Other endocrine features include hypercortisolism, acromegaly, and hyperthyroidism. Precocious puberty in McCune-Albright syndrome is typically peripheral and due to the activation of ovarian or testicular tissue. The evaluation includes serum estradiol and testosterone levels. Boys should have a testicular ultrasound to assess for hormonally active tumors. High levels of estradiol in girls may cause activation of the hypothalamic-pituitary-gonadal axis, triggering evaluation for central precocious puberty. Additionally, GnRH stimulation testing and serum measurements of luteinizing hormone and the follicle-stimulating hormone may be warranted.
- Characteristics of fibrous dysplasia include an increased number of thin and irregular trabeculae. The marrow spaces get replaced by fibroblastic tissue. Lesions may be monostotic (involving one bone) or polyostotic (multiple bones involved). Commonly identified by radiograph, fibrodysplasia shows a hazy, radiolucent, ground-glass pattern due to defective mineralization.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### McCune Albright Syndrome

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## Question 892: A 37-year-old female patient presents to the clinic with complaints of tiredness and inability to eat. She has a history of type-1 diabetes mellitus. On further workup, she was found to have metabolic acidosis, ketonemia, and ketonuria. However, her blood sugar was normal at 119 mg/dl. Most patients presenting with this condition while taking an SGLT2 inhibitor will do so within what timeframe of starting the medication?

## Choices:

1. The patient will develop immediate symptoms
2. Within 2 months of starting the medication
3. Longer than 1 year of taking the medication
4. At least 3 years on the medication

## Answer: 2 - Within 2 months of starting the medication

## Explanations:

- Symptoms of euglycemic diabetic ketoacidosis can start in the early days of beginning SGLT2 inhibitors and are most likely to occur within 2 months of starting the medication.
- It is not necessary for the symptoms to occur in the first 2 months, but this time period is taken as a median.
- Development of euglycemic diabetic ketoacidosis can occur at any time in response to a physical stressor but is most likely to occur within the first 2 months of starting the treatment.
- The longer the patient tolerates the medication of SGLT2 inhibitor the less likely the development of euglycemic diabetic ketoacidosis is to occur.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Euglycemic Diabetic Ketoacidosis

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## Question 893:

A 44-year-old woman presents to the clinic with complaints of progressive headache, visual disturbance, and back pain for the past three months. She reports that she can no longer fit in her clothes because they have become too tight in the past year. She denies changes in her diet or weight. Currently, she is afebrile and has a blood pressure of 165/96 mmHg with a pulse of 101 beats/min. Physical examination reveals enlarged, swollen hands and feet. She has coarse facial features, with frontal bossing and an enlarged jaw. She sweats excessively. What is the most common cause of death in patients with this condition?

## Choices:

1. Complications related to cardiovascular disease
2. Complications related to respiratory failure
3. Complications related to kidney failure
4. Complications related to colon cancer

## Answer: 1 - Complications related to cardiovascular disease

## Explanations:

- The most common cause of death in patients with acromegaly is cardiovascular disease, accounting for approximately 38- 62% of deaths.
- The effects of IGF-1 result in an enlarged heart, increased muscle mass and kidney size, hypertrophy of the joints, thickened skin, macroglossia, nerve entrapment syndromes, cerebral aneurysms, and hyperhidrosis.
- Individuals with acromegaly have 2-3 times the mortality rate compared to the general population.
- Respiratory causes account for 25%, and malignancy accounts for 9-25% of deaths. Hypertension occurs in approximately 30% of patients; however, hypertension itself is not solely responsible for the increase in cardiovascular mortality.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Acromegaly

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## Question 894:

A 65-year-old man, on dapagliflozin for his type 2 diabetes, presents to the hospital with complaints of fatigue and dyspnea for three days. He is afebrile, tachypneic, tachycardic, and has dry mucosa and delayed capillary refill. Laboratory studies are significant for pH 7.08, pCO2 11 mmol/L, bicarbonate 8 mEq/L, beta-hydroxybutyrate of 19 mmol/L, glucose 128 mg/dL, anion gap 23 mmol/L and lactate of 1.2 mmol/L. He remains dyspneic, and labs show persistent metabolic acidosis after intravenous saline. What should be the next step in the management of this patient?

## Choices:

1. Discontinue dapagliflozin and escalate the infusion rate of intravenous normal saline
2. Discontinue dapagliflozin and begin intravenous sodium bicarbonate infusion
3. Intravenous insulin 5 units/hr infusion and intravenous normal saline infusion at the rate of 100 ml/hr
4. Discontinue dapagliflozin and begin intravenous dextrose 5% with insulin 0.05 u/kg/hr infusion

Answer: 4 - Discontinue dapagliflozin and begin intravenous dextrose 5% with insulin 0.05 u/kg/hr infusion

## Explanations:

- Euglycemic diabetic ketoacidosis may be present in a patient with type 1 diabetes who had a recent change in the dosing of insulin. However, it can also be triggered in any patient with diabetes, and the usual triggers are pregnancy, abdominal surgery, pancreatitis, fasting, and use of sodium-glucose cotransporter 2 (SGLT2) inhibitors. Euglycemic diabetic ketoacidosis occurs from an imbalance between insulin and counter-regulatory hormones, such as glucagon, catecholamines, cortisol, and growth hormone. Ultimately EDKA results with elevated glucagon to insulin ratio.
- Euglycemic diabetic ketoacidosis is diagnosed with a blood glucose of less than 250 mg/dL, pH of less than 7.3, serum bicarbonate of less than 18 mEq/L, and ketonemia.
- The primary treatment of euglycemic diabetic ketoacidosis is with both dextrose (5-10%) and insulin (0.05-0.1 u/kg/hr) infusion, assuming serum potassium is above 3.3 mEq/L.
- It is essential to discontinue sodium-glucose cotransporter 2 (SGLT2) inhibitor use during euglycemic diabetic ketoacidosis until the illness has resolved.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Euglycemic Diabetic Ketoacidosis

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## Question 895:

A 47-year-old female patient was referred to the emergency department with an episode of loss of consciousness. Her vitals were blood pressure: 78/50 mmHg, pulse rate: 130 beats per minute, respiratory rate: 23/min, and temperature: 37.5 C. Her laboratory tests were sodium: 146 mEq/dl, potassium: 2.9 mEq/dl, blood glucose: 208 mg/dl, WBC: 4800 cells/mm3, Hb: 12.9 mg/dl, and platelet: 136000 cells/microliter. Following intravenous hydration, the blood tests are sodium: 148 mEq/dl, potassium: 2.8 mEq/dl, blood glucose: 180 mg/dl, without specific changes in CBC. Further potassium replacement was undertaken. She was admitted to the endocrinology ward for complementary investigations. Urinary free cortisol in 24 hour collected urine and plasma ACTH were 150 microgram/day (normal range: 50-100 microgram/day), and 50 picogram/ml (normal range: 10-60 pg/mL), respectively. What is the preferred definitive management?

## Choices:

1. Transsphenoidal hypophysectomy
2. Bilateral adrenalectomy
3. Obtaining a high dose dexamethasone suppression test
4. Adrenalectomy the larger adrenal gland

## Answer: 2 - Bilateral adrenalectomy

## Explanations:

- ACTH-independent hypercortisolism or adrenal originated Cushing syndrome might occur due to a couple of causalities, including primary pigmented nodular adrenal disease (PPNAD) or ACTH-independent macronodular adrenal hyperplasia (AIMAH).
- The former one is a benign situation and is categorized to those with or without association with the Carney complex. The treatment plan for both conditions with curative purpose is bilateral surgical resection of adrenal glands.
- The later one presents in the late 40s, mostly in male patients, and is characterized by extremely heavier adrenal glands, (almost 20-25 times heavier). The treatment plan is similar to the former one, which consists of bilateral surgical removal of adrenal glands and lifelong glucocorticoid replacement.
- Cushing disease might be presented with high ACTH, and a negative high dose suppression test could possibly be managed with transsphenoidal hypophysectomy. High dose dexamethasone suppression test could be utilized to differentiate ectopic secretion of ACTH and Cushing disease.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Adrenal Cortical Nodular Hyperplasia

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## Question 896:

A 56-year-old female presents to the outpatient clinic complaining of general malaise and headaches. She says she has palpitations, diaphoresis, and is very anxious all the time. She has noticed that her headaches can be very severe at times and are throbbing in nature. Her past medical history is unremarkable. She says her deceased sister had very high blood pressure. On physical exam, she has a blood pressure of 160/100 mm Hg and a pulse of 110 beats per minute. On her lips and tongue, you also discover a number of soft nodules that are non-tender. Which of the following tests should be ordered during the evaluation of the patient to confirm the diagnosis?

## Choices:

1. Serum parathyroid hormone
2. Serum calcitonin
3. Serum gastrin
4. Serum glucagon

## Answer: 2 - Serum calcitonin

## Explanations:

- The above patient presents with symptoms of pheochromocytoma and mucosal neuromas. She also has a deceased sister who had hypertension. This should lead one to suspect multiple endocrine neoplasia type 2B, which also involves medullary carcinoma of the thyroid. This tumor secretes calcitonin, so levels have to be obtained.
- Medullar thyroid cancer (MTC) is the most common manifestation of MEN2A and MEN2B with 100% penetrance and usually the first manifestation in MEN2 patients. MTC is a neuroendocrine tumor of the thyroid gland caused by the hyperplasia of calcitonin-producing parafollicular C-cells, the only cells in the thyroid gland derived from neural crest cells.
- Marfanoid habitus, kyphoscoliosis/lordosis, joint laxity, mucosal neuromas typically at lips and tongue, and intestinal ganglioneuromas are conditions exclusively associated with the MEN2B syndrome.
- Pheochromocytoma, a typically benign adrenal medullary tumor (usually bilateral and multicentric), occurs in 40% to 50% of patients with MEN2A or MEN2B. The classic symptoms of pheochromocytoma are paroxysmal attacks of a headache, anxiety, diaphoresis, and palpitations. Screening tests include plasma fractionated metanephrines or 24-hour urinary metanephrines and normetanephrine. If biochemical results are positive, the next step is adrenal imaging with CT or MRI. If initial imaging is unable to identify the unilateral versus bilateral disease, adrenal venous sampling can be done.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Multiple Endocrine Neoplasias Type 2

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## Question 897: A 17-year-old male presents with pain in the right upper abdomen. Abdominal examination is unremarkable. Ultrasound of the abdomen shows the presence of a hyperechoic mass exhibiting a "split diaphragm" sign in the right suprarenal region with undefined margins. Contrast-enhanced computed tomography (CT) scan of the abdomen reveals a well-defined, round lesion in the right suprarenal region measuring 5.0 x 3.7 cm with heterogeneous attenuation and very low Hounsfield unit density readings. Which of the following is the next best step in the management of this patient?

## Choices:

1. Adrenal biopsy
2. Watchful observation and monitoring
3. MRI abdomen and kidney
4. Serum cortisol levels

## Answer: 2 - Watchful observation and monitoring

## Explanations:

- The patient's history and radiological findings are consistent with a diagnosis of adrenal myelolipoma. These, along with lipid-rich adenomas, characteristically have very low densities on CT scans. They are both benign, non-functioning adrenal masses.
- Management of adrenal myelolipoma should be decided upon the size of the lesion and the presence of symptoms.
- Small lesions measuring less than 5 cm, and those who are asymptomatic are usually monitored via imaging over a period of one to two years.
- Symptomatic tumors or myelolipomas larger than 7 cm should undergo elective surgical excision. The approach is based on the reported incidence of life-threatening emergencies caused by spontaneous rupture and hemorrhage within large lesions.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Adrenal Myelolipoma

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## Question 898:

A 25-year-old woman presents with a seven-month history of amenorrhea, white nipple discharge, and decreased libido. She also complains of changes in her vision and frequent headaches. Her vital signs show oxygen saturation 98% on room air, respiratory rate 16 per minute, heart rate 78 beats per minute, blood pressure 110/82 mmHg, and temperature 98 F. On examination, the patient has decreased body hair and bitemporal hemianopsia. Her serum prolactin level is 130 ng/ml (5-20). An MRI is performed and shows a 4 cm macroadenoma, which appears to originate from the sella turcica. If the patient wishes to become pregnant in the future, which of the following is the best management for this patient's condition?

## Choices:

1. Cabergoline
2. Transsphenoidal resection of the pituitary
3. Repeat MRI in 4 months
4. Estrogen replacement

## Answer: 2 - Transsphenoidal resection of the pituitary

## Explanations:

- This patient's symptoms are consistent with a prolactinoma. The headaches, vision changes, and bitemporal hemianopsia suggest mass effect, which distinguishes the diagnosis of prolactinoma from other causes of hyperprolactinemia.
- Transsphenoidal surgery is the preferred treatment option for a prolactinoma for a female with large prolactinoma who wishes to become pregnant. Prolactinomas can become larger during pregnancy.
- Based on the size of the tumors, prolactinomas can be classified as micro prolactinoma (smaller than 10 mm), macroprolactinoma (larger than 10 mm) or, giant prolactinoma (larger than 4 cm).
- Bromocriptine is preferred over cabergoline during pregnancy due to the more extensive safety data available. Repeating MRI in four months without treatment in a macroadenoma of 4 cm is not recommended. Estrogen replacement would not be recommended in a patient who is desiring to become pregnant.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Prolactinoma

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## Question 899:

A 36-year-old woman G2P1 presents to the office for an antenatal visit at 20 weeks of gestation. She complains of polyuria and nocturnal leg cramps. She is a known case of Graves disease who was consuming methimazole before conception, which was changed to propylthiouracil after pregnancy. Her temperature is 98.7 F, blood pressure 124/82 mmHg, heart rate 78/min, and respiratory rate 17/min. On examination, there is no pedal edema. She has normal S1 S2 and clear bilaterally symmetrical breath sounds. The abdomen is symmetrically enlarged with a fetal heart rate of 130/min, and the fundus palpated at the umbilicus. Routine antenatal level 2 ultrasound shows no abnormalities. At her visit at 16 weeks, her thyroid function test and maternal serum markers were normal. What is the next best step in the management of this patient?

## Choices:

1. White blood cell count
2. Thyroid function test
3. Liver function test
4. Change the anti-thyroid drug

## Answer: 4 - Change the anti-thyroid drug

## Explanations:

- Methimazole is associated with fetal anomalies and hence propylthiouracil is the drug of choice for the first trimester when organogenesis takes place.
- Keeping in mind the risk of maternal hepatotoxicity associated with propylthiouracil, it should be shifted to methimazole in 2nd and 3rd trimester.
- Thyroid functions should be routinely done in a patient consuming propylthiouracil, but this patient had normal test results 4 weeks back.
- Agranulocytosis is a well-reported side-effect of propylthiouracil but does not require routine monitoring unless any sign of infection. Liver function tests are not routinely done in a patient on propylthiouracil unless there are symptoms of liver disease. Polyuria and nocturnal leg cramps are normal physiological findings in pregnancy as the uterus grows and compresses surrounding structures.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Propylthiouracil (PTU)

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## Question 900:

A 65-year-old male with type 2 diabetes and coronary artery disease has laboratory tests done prior to his visit. The tests reveal albuminuria of 350 mg/g creatinine, a normal estimated glomerular filtration rate of 65 ml/min, a glycated hemoglobin of 8% with a fasting plasma glucose of 185 mg/dL. He is presently on metformin 2g/d, diet, and regular exercise. His provider starts him on a newer oral therapy that has been shown to reduced cardiovascular events and the progression of albuminuria. What is the potential adverse effect of this medication?

## Choices:

1. Hypoglycemia
2. Edema
3. Urinary tract infections
4. Acute pancreatitis

## Answer: 3 - Urinary tract infections

## Explanations:

- SGLT2 inhibitors can lower blood glucose, glycated hemoglobin , blood pressure and body weight.
- They can cause both genital and urinary tract infections because of the excess glucosuria.
- Since they reduce cardiovascular events and progression of renal disease they are a good adjunctive therapy to metformin.
- They do not cause hypoglycemia when used with metformin or as monotherapy. GLP-1 medications can cause pancreatitis. Thiazolidinedione causes edema as a side-effect.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Physiology, Glycosuria

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## Section 10

Question 901: A male complains of progressive fatigue, weakness, and weight gain. He has no significant past medical history. Exam shows an obese male with fat deposition at the posterior neck, face, and trunk. Purple striae are present over the abdomen. What radiopharmaceutical is best for confirmation of your diagnosis?

### Choices:

1. Use I-123 NP-59 to image the adrenal medulla
2. Use I-123 NP-59 to image the adrenal cortex
3. Use I-123 MIBG to image the adrenal cortex
4. Use I-123 MIBG to image the adrenal medulla

## Answer: 2 - Use I-123 NP-59 to image the adrenal cortex

## Explanations:

- NP-59 images the adrenal cortex. It is an iodocholesterol, and thus an analog of adrenal cortical hormone precursors.
- MIBG, metaiodobenzylguanidine, images the adrenal medulla. It is an analog of norepinephrine.
- All imaging is done by labeling these agents to I-123. All therapy is done by labeling these agents to I-131.
- NP-59 can be used to image for causes of Cushing syndrome, hyperaldosteronism, and hyperandrogenism. MIBG, taken up by chromaffin cells, can be used to image for pheochromocytoma, neuroblastoma, and paraganglioma.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Cushing Syndrome

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## Question 902:

A 36-year-old woman presents to the clinic diminution of vision and headaches for the past 2 years. There are no other complaints. An MRI shows a pituitary growth. An octreotide scan with 111In-DTPA-octreotide visualizes the tumor. What is the most likely type of pituitary tumor in this patient?

## Choices:

1. Non-functioning pituitary adenoma
2. ACTH secreting pituitary adenoma
3. TSH secreting pituitary adenoma
4. Prolactinoma

## Answer: 1 - Non-functioning pituitary adenoma

## Explanations:

- Somatostatin analogs (technetium depreotide, DTPA) are used in imaging of pituitary tumors.
- Pituitary prolactin and adrenocorticotrophic hormone (ACTH) secreting adenomas cannot be localized, but clinically non-functioning pituitary adenomas may be visualized in 75% of cases with 111In-DTPA-octreotide.
- As the patient does not have any endocrine symptoms, a diagnosis of non-functioning pituitary adenoma is favored.
- Positive test results mean patients with growth hormone (GH) and thyroid-stimulating hormone (TSH) secreting pituitary tumors may have a good suppressive effect of octreotide on hormone release by these tumors.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Octreotide Scan

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## Question 903: A 57-year-old male patient comes to the cardiology clinic for follow up. Recently, he has hospitalized due to acute pancreatitis. Now, He is on routine fenofibrate and statin consumption. His family history reveals that his father also hospitalized for frequent bouts of pancreatitis. On physical examination, his vitals were normal. The cardiologist noted that there were xanthelasma and xanthoma and hepatosplenomegaly. He was sent to the lab for a cholesterol test. After a blood draw, his supernatant appeared milky. What is the most appropriate cholesterol estimation method?

## Choices:

1. Direct Method
2. Indirect Method
3. Friedewald Method
4. Martin-Hopkins Method

## Answer: 4 - Martin-Hopkins Method

## Explanations:

- In this scenario, he likely has a hyperchylomicronemia or type I familial hypercholesterolemia.
- This disease is linked with a very high elevation in triglycerides (TG) levels.
- The Martin-Hopkins method incorporates adjustable factors for the ratios of triglyceride and very-low-density lipoprotein (VLDL) that is still accurate even when TGis above 400 mg/dL.
- The Friedewald method can't be used because the ratio of TG and VLDL is constant, i.e., 5:1.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Cholesterol Screening

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## Question 904: A patient has a lingular mass, buffalo hump, moon facies, abdominal obesity, striae, hypertension, and hypokalemia. What test should be ordered?

## Choices:

1. ACTH level
2. Parathyroid hormone-related peptide (PTHrp)
3. Urinary electrolytes
4. Thyroid-stimulating hormone

## Answer: 1 - ACTH level

## Explanations:

- The patient is Cushingoid.
- This is most likely secondary to ACTH secreted by a small cell carcinoma of the lung.
- ACTH and cortisol would be elevated.
- High concentrations of cortisol can stimulate mineralocorticoid receptors.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Cushing Syndrome

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## Question 905: Which of the following diseases may be strongly associated with short stature and precocious puberty in males?

## Choices:

1. Congenital adrenal hyperplasia
2. Hypothyroidism
3. Growth hormone deficiency
4. Cushing syndrome

## Answer: 1 - Congenital adrenal hyperplasia

## Explanations:

- Congenital adrenal hyperplasia causes variable degrees of ambiguous genitalia in females and may cause premature pubarche in males and, if untreated, can cause true central puberty and precocious puberty in males causing estrogen-mediated bone advancement and premature closure of growth plates resulting in short stature.
- The most common cause is deficiency of 21-hydroxylase enzyme which is detected by increased levels of 17 OH progesterone.
- Hypothyroidism is associated with short stature and developmental delay. Profound hypothyroidism in females with a significant elevation in the TSH can cause precocious puberty. Bone age is typically delayed, and multicystic ovaries can be found on ultrasound. Elevated TSH levels are thought to act on the FSH receptor, which can cause breast development and menstrual bleeding. Patients often present without concurrent pubarche. Treatment with levothyroxine normalizes TSH values and resolves the precocious puberty.
- Growth hormone deficiency causes growth failure but not precocious puberty.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Congenital Adrenal Hyperplasia

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## Question 906:

A 40-year man presents with loss of vision in the right eye for the past 10 days. The patient has been hyperthyroid for 2 years and is non-compliant with treatment. No history of trauma or pain is present. Examination reveals bilateral proptosis with lid edema, conjunctival congestion, chemosis with a best-corrected visual acuity of 20/200 in the right eye and 20/20 in the left eye. Further evaluation reveals relative afferent pupillary defect and unilateral optic disc edema and choroidal folds in the right eye. Which of the following radiological features is most likely to be seen in the right eye?

## Choices:

1. Optic nerve sheath enhancement with normal nerve on magnetic resonance imaging (MRI)
2. Intracranial fat prolapse through the inferior orbital fissure
3. A Barrett's muscle index of 75% with hyperintense extra-ocular muscle (EOM) signals on T2-weighted fat-suppressed MRI sequence
4. Decrease in the calibration of the superior ophthalmic vein

## Answer: 3 - A Barrett’s muscle index of 75% with hyperintense extra-ocular muscle (EOM) signals on T2-weighted fat-suppressed MRI sequence

## Explanations:

- This is likely a case of right dysthyroid optic neuropathy (DON) with bilateral thyroid eye disease (TED). Radiological evidence of compression can be elicited by apical crowding, dilated superior ophthalmic vein diameter, Barrett's muscle index, intracranial prolapse of orbital fat through the superior orbital fissure, or an increased extra-ocular muscle volume.
- A Barrett’s muscle index of more than 60% is suggestive of DON. A value of less than 50% makes DON less likely. However, in cases of severe exophthalmos with stretch optic neuropathy, Barrett’s MI may be absolutely normal. Unfortunately, there is no single radiological pathognomic feature of DON.
- Barrett’s muscle index is calculated by multiplying the vertical or horizontal muscle index (whichever is greater) by 100. The horizontal muscle index is calculated by dividing the sum of diameters of medial and lateral recti by the horizontal dimension of the orbit. Likewise, the vertical index is measured by dividing the sum of diameters of superior and inferior recti by the vertical height of the orbit. The line must pass through the optic nerve in the coronal view.
- Optic nerve sheath enhancement with normal nerve imaging may be observed in the case of optic perineuritis, not in DON.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Dysthyroid Optic Neuropathy

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## Question 907:

A 14-year-old girl is brought to the clinic for an annual physical exam. She is noted to have yellow-white plaques on her extensor tendons. A serum sitosterol level is 320 mg/dL (reference range 80mg/dL). Which of the following complications is most likely to occur in this patient?

## Choices:

1. Premature atherosclerosis
2. Muscle dystrophy
3. Thrombocytosis
4. Left ventricular hypertrophy

## Answer: 1 - Premature atherosclerosis

## Explanations:

- This patient has sitosterolemia, which can directly lead to premature atherosclerosis.
- Patients diagnosed with sitosterolemia should undergo an ischemic cardiac evaluation depending on how advanced the disease process is with their sitosterolemia. This ischemic evaluation may include coronary CT imaging and/or calcium scoring.
- Sitosterolemia can also lead to thrombocytopenia.
- Left ventricular hypertrophy is not directly linked to sitosterolemia.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hereditary Sitosterolemia

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## Question 908:

A 75-year-old male presents with unintentional weight loss, anxiety, tremor, palpitations, insomnia, and heat sensitivity. He also complains of diplopia, headaches, and nausea. On physical examination, he is hyperhidrotic with tremors and a rapid irregularly irregular pulse, and his visual fields reveal bilateral temporal superior quadrantanopsias. His thyroid-stimulating hormone level (TSH) is 9.8 mIU/L, free T4 level is 2.4 ng/dL, and the free T3 level is 750 pg/dL. Which 24-hour I-123 RAIU result would explain his clinical presentation?

## Choices:

1. 1%
2. 10%
3. 25%
4. 50%

## Answer: 4 - 50%

## Explanations:

- Unintentional weight loss, anxiety, tremor, palpitations, insomnia, and heat sensitivity are symptoms of hyperthyroidism, while hyperhidrosis with tremors and a rapid irregularly irregular pulse are signs of hyperthyroidism.
- Diplopia, headaches, and nausea are symptoms of pituitary adenoma, while visual field defects with bilateral temporal superior quadrantanopsias are signs of a pituitary adenoma.
- If the hypothalamic-pituitary-thyroid axis is working correctly, elevated free T4 and free T3 should lead to feedback decrease in TSH levels. A high TSH in the setting of laboratory-confirmed hyperthyroidism indicates a hypothalamic or pituitary disorder. A pituitary macroadenoma can cause compression of the optic chiasm leading to bitemporal superior quadrantanopsias.
- A TSH secreting pituitary adenoma can cause thyrotoxicosis of extrathyroidal origin associated with elevated I-123 RAIU. Other thyrotoxicoses of extrathyroidal origin, such as factitious hyperthyroidism, thyroid hormone-producing metastatic thyroid cancer, and struma ovarii, are associated with decreased I-123 RAIU. Normal 24 hour RAIU ranges are usually around 10% to 35% but vary by laboratory.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### I-123 Uptake

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## Question 909:

A 26-year-old man is admitted to the hospital after a motor vehicle trauma. He had sustained femur and multiple rib fractures. No head injuries are visible. He does not have any medical problems or allergies. Family history is positive for hypothyroidism. Two days after surgery for femur fracture, he develops hypotension with systolic BP 60 to 90 mmHg and a heart rate of 106/min. He complains of weakness and fatigue but no other symptoms. On physical exam, he looks slightly pale but otherwise normal. Random cortisol is 18 mcg/dL. A 250 mcg cosyntropin stimulation test is ordered and shows baseline cortisol 26 mcg/dL, while cortisol at 30 and 60 minutes are both 32 mcg/dL. What is the next best step in the management of this patient?

## Choices:

1. Hydrocortisone
2. Evaluate for other causes of hypotension
3. Methylprednisolone
4. Exploratory laparotomy

## Answer: 2 - Evaluate for other causes of hypotension

## Explanations:

- The clinical vignette shows a critically ill patient who is experiencing hypotension.
- The patient is most likely maximally stimulated and hence, would not record a great increase with cosyntropin.
- Always evaluate for other causes of hypotension.
- Although internal blood loss is a possibility, immediate exploratory laparotomy is not the best answer.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Adrenocorticotropic Hormone Test

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## Question 910:

A 50-year-old woman presents to the healthcare provider with a chronic, non-healing ulcer on her lower limb. She has a history of diabetes mellitus that has been poorly controlled. Treatment with daily dressing and antibiotics has not been helpful. It is decided to start the patient on 100% oxygen at 2.4 atm. Before initiating treatment, measurement of oxygen tension using a surface electrode is carried out. The oxygen pressure is 70 mmHg at the chest and 35 mmHg around the wound. Provocative testing is carried out using 100% at 1.0 atm. A reading of 450 mmHg is obtained at the chest electrode and 205 mmHg at the electrode placed near the wound. What do these readings signify?

## Choices:

1. The increased wound healing potential
2. Significant underlying macrovascular disease
3. Necrotic wound requiring amputation
4. Pulmonary disease impairing perfusion

## Answer: 1 - The increased wound healing potential

## Explanations:

- This patient presents with a chronic non-healing wound and is planned for hyperbaric oxygen therapy (HBOT). Transcutaneous oximetry (TcpO2) can be useful in selecting patients for HBOT. Low tissue oxygenation, which improves post oxygen challenges, predicts a good response to hyperbaric therapy.
- A resting peri-wound TcpO2 below 40 mmHg in patients with diabetes and 30 mmHg in patients without diabetes indicated significant wound hypoxia and HBOT use may be beneficial, provide that improvement is seen upon administration of 100 % oxygen.
- An increase from the baseline to above 100% or an absolute value above 100 mmHg implies the potential of wound healing from hyperbaric therapy. The value of 200 mmHg at elevated atmospheric pressure also has prognostic value for wound healing.
- Transcutaneous oximetry is a non-invasive test that can predict the likelihood of a successful HBOT regimen. Necrotic wound with poor viability is reflected by low TcpO2 values after oxygen challenge. The pulmonary disease will have low resting values in the control chest electrode, and macrovascular disease can be ascertained by carrying out leg elevation testing.

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## Research Concepts:

### Hyperbaric Transcutaneous Oximetry

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## Question 911:

A 55-year-old female comes for evaluation. She is diagnosed with primary hyperparathyroidism. She has no symptoms but her serum calcium level is 10.8 mg/dl ( normal 8.5-10 mg/dl), parathyroid hormone is 110pg/ml, (normal: 10-65 pg/mL), 24-hour urinary calcium of 330 mg/d (normal: 25-300 mg/d), and a serum 25-hydroxyvitamin D of 75 ng/mL (normal: 10-100 ng/mL). Recently she was found to have a 5 mm renal stone in the abdominal ultrasound. Which feature makes her an appropriate candidate for parathyroidectomy?

## Choices:

1. Age 55
2. Serum calcium level
3. Parathyroid hormone level
4. Renal stone

## Answer: 4 - Renal stone

## Explanations:

- The most likely cause of hypercalcemia in this age group is a malignancy (lung cancer or breast cancer are the most likely culprits in this female smoker), whether from a solid metastatic tumor, a paraneoplastic syndrome, or hematologic cancer.
- With an appropriately depressing intact parathyroid hormone level, no reason exists to suspect persistent hyperparathyroidism.
- Most patients were diagnosed when they had complaints of nephrolithiasis, bone pain, or bone deformity. Surgery remains the definitive treatment for primary hyperparathyroidism.
- The current guidelines state that surgery should be recommended for asymptomatic primary hyperparathyroidism include serum calcium is more than 1 mg/dL greater than the upper limit of normal, age younger than 50 years, osteoporosis, glomerular filtration rate less than 60 mL/min, urine calcium greater than 400 mg/24 hours, and evidence of renal calcification or stones.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Parathyroidectomy

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## Question 912: A patient undergoes abdominal surgery for a splenic rupture and receives many units of transfused blood. Post-surgery he complains of numbness around his mouth and a carpopedal spasm. An electrocardiogram reveals a prolonged QT interval. Which of the following would be the best intravenous treatment for this patient?

## Choices:

1. Bicarbonate
2. Potassium
3. Calcium
4. D50

## Answer: 3 - Calcium

## Explanations:

- Chvostek sign occurs when tapping the skin over the facial nerve causes ipsilateral contraction of facial muscles. This is a suggestive sign of hypocalcemia.
- Trousseau's sign occurs when the blood pressure cuff is inflated on the arm and causes flexion of the wrist and extension of interphalangeal joints. The thumb usually adducts. Trousseau's sign is more specific for hypocalcemia.
- Other abnormalities that may occur in hypocalcemia include athetosis, dystonic spasm, Parkinson disease, and hemiballismus.
- Coarse hair, brittle nails, and dry skin are other features of long-standing hypocalcemia.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hypocalcemia

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## Question 913: A 16-year-old girl with no past medical history presents before starting the school year. She expresses interest in joining her school's field hockey team. Her body mass index (BMI) is 18.5 kg/m2, and she admits to being a picky eater. She has regular monthly menstrual periods that last six days. For which of the following concerns should she be advised to return to the office?

## Choices:

1. A sudden increase in muscle mass
2. Menorrhagia
3. Amenorrhea
4. Increased estrogen levels

## Answer: 3 - Amenorrhea

## Explanations:

- Amenorrhea is a concern, especially in intensely training female athletes with low BMI and poor nutrient intake. This is due to a hypoestrogenic state and can result in amenorrhea and even stress fractures. Estrogen levels, along with regular menstrual cycles, will return after lowering the intensity of exercise or increasing body weight and nutrition status.
- Physical exercise involves a wide variety of responses from multiple organ systems, including the endocrine system. As part of the response, epinephrine and testosterone levels will increase, while insulin and estrogen levels decline slightly.
- Nutrition is important when participating in intense physical exercise, such as organized sports with regular practice and competition sessions. Along with rest, proper nutrient intake is needed for the body to repair itself after intense exercise. Prolonged periods of malnutrition with concurrent intense exercise can lead to an even lower BMI, stress fractures, and other injuries.
- Exercise and sports participation has been shown to increase concentration and cognition. A healthy balance of physical activity can be very beneficial for high school students to maintain healthy body weight and provide an outlet for stress.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Female Athlete Triad

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## Question 914: Which of the following conditions can be diagnosed with almost 100% sensitivity and specificity using fine-needle aspiration?

## Choices:

1. Medullary cancer
2. Colloid nodule
3. Follicular cancer
4. Papillary cancer

## Answer: 4 - Papillary cancer

## Explanations:

- Fine-needle aspiration (FNA) is an excellent diagnostic tool, particularly for patients with papillary carcinoma.
- The diagnosis of papillary carcinoma of the thyroid can be made by evaluation of individual cellular pathology. Medullary carcinoma and anaplastic carcinoma are very hard to diagnose with FNA and the sensitivity, in most large series, is nowhere near 100%.
- Follicular carcinoma cannot be diagnosed using FNA because documentation of vascular invasion is necessary to make the diagnosis.
- A colloid nodule can be diagnosed with FNA by demonstrating colloid and macrophage deposition; however, the sensitivity of this diagnosis is not 100%.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Papillary Thyroid Carcinoma

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## Question 915:

A 65-year-old male presents with complaints of bone pains and hematuria for one month. Urinalysis revealed the presence of red blood cells casts and calcium crystals. The physical examination was unremarkable. Blood workup revealed a serum calcium level of 12.1 mg/dL, parathyroid hormone (PTH) level of 154 pg/mL, and 25-hydroxyvitamin D level of 19.2 ng/mL. X-ray of hands showed subperiosteal bone resorption of digits, and chest x-ray demonstrated distal clavicular resorption. 24-hour urinary calcium levels were noted to be 504 mg/L. Which of the following type of hypercalciuria is associated with this disease?

## Choices:

1. Absorptive hypercalciuria
2. Resorptive hypercalciuria
3. Renal phosphate leak
4. Renal calcium leak

## Answer: 2 - Resorptive hypercalciuria

## Explanations:

- Resorptive hypercalciuria accounts for only about 3% to 5% of all hypercalciuric patients and is almost always due to hyperparathyroidism. Osteoclastic activity increases due to excessive parathyroid hormone (PTH) and dumps calcium into the blood, causing hypercalcemia and hypercalciuria.
- Hypercalcemia overcomes the normal parathyroid hormone effect of decreasing urinary calcium excretion, and the result is hypercalciuria (e.g., similar to spilling sugar in the urine in patients with diabetes mellitus). Thus, the hypercalciuria from hypercalcemia is less for any given elevated serum calcium level in patients with hyperparathyroidism than in other patients who are hypercalcemic.
- Hyperparathyroidism is sometimes described clinically as "moans, bones, stones, and groans," referring to the pains and renal calculi produced by the disease.
- In renal phosphate leak hypercalciuria, there is low or low-normal serum phosphate, hypercalciuria, high urinary phosphate, and elevated serum Vitamin D3 levels with normal serum calcium and PTH levels. Renal calcium leak is usually accompanied by hypocalcemia and an increase in serum parathyroid hormone (PTH) levels.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hypercalciuria

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## Question 916: A 13-year-old female patient presents to the hospital with nausea, vomiting, lethargy, drowsiness and dehydration. Her mother states that the patient has had profuse diarrhea in the past three weeks. On examination, she looks dehydrated and pale. Her Glasgow coma score is 9/15. Lab investigations reveal blood sugar 425 mg/dl. The arterial blood gas report shows a pH of 7.01. What is the leading cause of death in such patients?

## Choices:

1. Cerebral edema
2. Fluid overload
3. Congestive heart failure
4. Renal damage

## Answer: 1 - Cerebral edema

## Explanations:

- Fluid shifts that occur from the rapid lowering of blood sugar and aggressive hydration can lead to cerebral edema and neurologic damage in patients with diabetic ketoacidosis (DKA). Administer 10-20 mL/kg fluid bolus of normal saline, slowly, over one to two hours in the pediatric population to prevent cerebral edema related complications. The bolus can be repeated slowly as well. DKA policies and replacement guidelines exist and are hospital or institution-specific and include regular insulin administration in the form of an intravenous infusion. Monitor for mental status changes and cardiac rhythm disturbances closely.
- Cerebral edema is most likely to occur between 4 and 12 hours after therapy initiation but can occur at any time within the first 24 hours of therapy.
- If cerebral edema is suspected, treatment includes decreasing the fluid administration rate and mannitol administration.
- Osmotic diuresis as a result of elevated blood sugar levels leads to hyponatremia and hypokalemia. Monitor closely for rhythm and ECG changes.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Pediatric Diabetic Ketoacidosis

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## Question 917:

A 47-year-old man comes for a routine checkup. He has no complaints. His past medical history is significant for lymphoma in the supraclavicular and axillary regions, treated with ionizing radiation therapy 15 years ago. Post-radiotherapy, he was treated with daunorubicin and vincristine. Follow-up investigations reveal no metastases or residual disease. Family history is significant for colon cancer in his brother and chronic lymphocytic leukemia in his aunt. He has a 10-pack-year smoking history but has now quit smoking. Which of the following is the patient increased risk for developing?

## Choices:

1. Cardiotoxicity
2. Peripheral neuropathy
3. Peptic ulcer disease
4. Thyroid cancer

## Answer: 4 - Thyroid cancer

## Explanations:

- Exposure to radiation causes DNA instability due to the direct breakage of DNA or through the production of reactive oxygen species. Both DNA strand breakage and reactive oxygen species formation damage the structure and function genome.
- The patient's previous exposure to radiation caused mutagenesis within thyroid tissues, causing an increased risk for thyroid cancer. The thyroid gland uptakes radioactive iodine produced during radiation exposure, increasing the risk for future carcinogenesis to occur.
- Patients who receive ionizing radiation are at increased risk for a variety of cancers. Side effects of radiation therapy include mucositis, dry skin, fatigue, nausea, abdominal pain, weight loss, and pancytopenia.
- Vincristine has a notorious side-effect of peripheral neuropathy. In this patient with no symptoms and cessation of therapy, it is not recommended to monitor. H.pylori, alcohol, NSAIDs, and smoking are thought to cause peptic ulcer disease. Daunorubicin can cause does dependent cardiotoxicity, but it usually resolves after cessation of therapy.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Genetics, Somatic Mutation

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## Question 918: A 25-year-old woman with a past medical history significant for schizophrenia is brought to the clinic with a chief complaint of increased urinary frequency for two weeks. For around a week, she has been nauseated and vomiting as well. Risperidone is the only medication she takes for her schizophrenia and has been on this medication since she was diagnosed at 21. She reports that her periods have been irregular for around one year. She has a BMI of 31 and was diagnosed with polycystic ovarian disease 6 months ago. She was prescribed metformin since then. She and her husband say that they have been trying to have a baby in the last year with no success. Her urinalysis shows a WBC count of 2 cells per HPF. Her labs are significant for serum sodium level of 131 mEq/L. What is the next best step in the management of this patient?

## Choices:

1. Serum beta-human chorionic gonadotropin
2. Serum copeptin level
3. Water deprivation test
4. Urine osmolality

## Answer: 1 - Serum beta-human chorionic gonadotropin

## Explanations:

- The next best step would be to check a serum beta-human chorionic gonadotropin (HCG) level to rule out pregnancy. There are reasons to suspect this patient might be pregnant since she has nausea and vomiting besides increased urinary frequency, besides trying to get pregnant. Nausea, vomiting, and increased urinary frequency are common in the first trimester of pregnancy and are normal.
- Even though there is a suspicion for primary polydipsia given the history of schizophrenia and increased urine frequency, it would still be prudent to rule out pregnancy first before thinking about primary polydipsia. Primary polydipsia is a diagnosis of exclusion.
- We need to be cognizant of the fact that schizophrenic patients can present with hyponatremia in pregnancy. In pregnancy, serum sodium levels can be lower, up to 130 mmol/l. This is because of increased vasopressin secretion from the physiologic lowering of the osmotic threshold and is normal.
- The patient takes risperidone, which is known to cause increased prolactin levels and irregular menstruation in some patients but not in all, and it is still possible to get pregnant while on this medication. She takes metformin for PCOS. Checking urine osmolality and copeptin levels can be done after checking serum HCG to rule out pregnancy. If she is positive for pregnancy, it would explain her presentation, likewise with the water deprivation test. There is a chance of missing the diagnosis of pregnancy with other choices.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Primary Polydipsia

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## Question 919:

A 66-year-old woman presents to the clinic for consideration of open or laparoscopic hernia repair. She has a past medical history of hypothyroidism, obesity with a BMI of 35 kg/m2, type 2 diabetes, and asthma. She has a pacemaker for paroxysmal bradycardias, which has been checked six months ago and is working well. She drinks seven units of alcohol weekly and does not smoke. She takes insulin with oral antidiabetic agents, thyroxine, and uses two inhalers. On clinical examination, there is an easily reducible left inguinal hernia. Which of the following is the most appropriate strategy to decrease the chances of post-operative wound infection?

## Choices:

1. Obtaining a euthyroid state, optimizing diabetic control, and alcohol cessation
2. Losing weight, obtaining a euthyroid state, and optimizing diabetic control
3. Losing weight, obtaining a euthyroid state, optimizing both diabetic and asthma control
4. Losing weight, obtaining a euthyroid state, abstaining from alcohol, obtaining a euthyroid state, and optimizing both diabetic and asthma control; also, having a pacemaker check preoperatively

## Answer: 3 - Losing weight, obtaining a euthyroid state, optimizing both diabetic and asthma control

## Explanations:

- Obesity and diabetes mellitus type 2 are the only two established independent risk factors for postoperative wound infections in this scenario, but a well-optimized patient's American Society of Anaesthesiologists' (ASA) grade might be lower (and ASA grade is an independent risk factor). Therefore all medical conditions should be optimized.
- Obesity is a risk factor of multiple complications, and it is reasonable to defer elective surgery as long as the overall risks outweigh the benefits.
- The clinician could measure the patient's blood glucose in the clinic, but that only provides a picture of the present state. HbA1c provides a three-month picture of glycemic control.
- For thyroxine adjustments, T3/T4 and TSH are the important blood tests in correlation with the clinical picture and patient symptoms. Weekly alcohol intake of 7 units is not deemed significant and would not influence wound healing capabilities. A well-maintained pacemaker should not cause an issue regarding wound healing.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Postoperative Wound Infection

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## Question 920:

A 55-year-old man presents for a check-up. He has a past medical history of uncontrolled hypertension. His vital signs show oxygen saturation 97% on room air, respiratory rate 16 per minute, heart rate 89 bpm, and blood pressure 160/100mmHg. Blood tests show a low plasma renin level with elevated serum aldosterone levels. Sodium loading for several days did not reduce serum aldosterone levels. An overnight dexamethasone suppression test is performed, which does not suppress aldosterone levels. What is the most appropriate next step in the management of this patient?

## Choices:

1. Repeat plasma renin test
2. Repeat aldosterone test
3. Check urinary free cortisol in 24-hour urine
4. Obtain a CT scan of the abdomen

## Answer: 4 - Obtain a CT scan of the abdomen

## Explanations:

- The diagnosis of hyperaldosteronism is suggested by elevated aldosterone in the presence of volume expansion, low renin levels with volume depletion, and the lack of edema even with diastolic elevation.
- Hyperaldosteronism without a solitary adenoma makes bilateral cortical nodular hyperplasia likely.
- From the very early steps of evaluation, obtaining brain MRI and abdominal CT scan is recommended for ACTH-dependent and ACTH-independent, respectively.
- Chest and abdominal pelvic CT scans should be obtained to clarify the possible underlying cause of Cushing disease.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Adrenal Cortical Nodular Hyperplasia

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## Question 921:

A 45-year-old woman with a history of hypertension, diabetes mellitus, diabetic foot neuropathy, and polycystic ovarian syndrome (PCOS) presents to the office for a follow-up visit. Over the past several months, she has noticed an increase in her weight by 2 kg that she attributes to starting a new oral contraceptive medication for her PCOS. She notes that her PCOS symptoms are much better controlled at this time due to the medication change. Her blood pressure is 120/80 on average measurement, and she denies any new symptoms related to her multiple diagnoses. She continues to be adherent to her maximal guideline-directed medical therapy. Her physical examination is pertinent for a loss of fine touch and proprioception in her lower extremities in a “stocking” distribution bilaterally up to her calves. Lab values at this visit are significant for a hemoglobin A1c level of 6.0%. Which of the following is the most appropriate initial recommendation for this patient?

## Choices:

1. Stop her oral contraceptive medication
2. Injectable insulin
3. Glimepiride
4. A trial of a diet low in processed foods

## Answer: 4 - A trial of a diet low in processed foods

## Explanations:

- This patient is asking for counseling regarding weight loss in the setting of multiple medical comorbidities that have a predilection for weight gain. At this point, she is on the maximal guideline-directed medical therapy, with well-controlled blood pressure and hemoglobin A1c level. She continues to have symptoms of diabetic neuropathy. The most appropriate counseling at this time of the choices presented is to trial a paleolithic diet.
- Multiple small short-term (6 months) studies have found that the paleolithic diet is similar in efficacy to the diabetic diet for lowering HbA1c levels, triglyceride levels, diastolic blood pressure, weight, and waist circumference. As compared to the commonly accepted diabetic diet, the Paleolithic diet is lower in cereals and dairy products, but higher in lean meat, fish, eggs, and fruits and vegetables.
- Overall, the paleolithic diet contains foods that are lower in glycemic index (GI), helping to increase insulin sensitivity. In addition, most studies have shown that overall caloric intake from this diet is lower than in comparable healthy diets, proposed to be most likely due to the satiating effects of the food consumed, which results in weight loss. It has not been shown to be superior to the Mediterranean diet for improving glycemic control.
- It would be inappropriate for this patient to stop her oral contraceptive as it is helping her with her PCOS symptoms. Insulin and sulfonylurea therapy in this patient would be putting the patient at risk for weight gain and hypoglycemia and are not medically indicated considering her hemoglobin A1c level.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Paleolithic Diet

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## Question 922: A 39-year-old man is found to have a 2.5 cm thyroid nodule seen on ultrasound of the neck. Fine-needle aspiration reveals follicular cells. Which of the following is the next best step in the management of this patient?

## Choices:

1. Thyroid uptake scan
2. Lobectomy and isthmusectomy
3. Total thyroidectomy
4. Total thyroidectomy with lymph node dissection

## Answer: 2 - Lobectomy and isthmusectomy

## Explanations:

- If a nodule reveals follicular cells, it is imperative to perform a lobectomy and isthmusectomy to rule out follicular carcinoma.
- Follicular carcinoma is the diagnosis if there is invasion of the capsule.
- A thyroid uptake scan will not help in assessing how active the nodule is in this case. At this point, the biopsy already shows follicular cells. Carcinoma must be ruled out.
- Total thyroidectomy is too aggressive and as is a lymph node dissection. Ipsilateral thyroidectomy is recommended depending on the location of the thyroid nodule.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Thyroid Adenoma

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## Question 923:

A 17-year-old woman has had irregular menses since the onset of menarche at age 10 years. The physical exam is remarkable for hirsutism and a body-mass index of 30 kg/m2. Pelvic ultrasound reveals the presence of greater than 12 antral follicles in the right ovary. Blood lab results return an abnormally elevated total testosterone. Which of the following is the most likely source of this testosterone?

## Choices:

1. Theca cells
2. Granulosa cells
3. Leydig cells
4. Sertoli cells

## Answer: 1 - Theca cells

## Explanations:

- This patient has the hallmark signs and symptoms of polycystic ovary syndrome (PCOS). Recall that ovarian theca cells are the source of testosterone in women, and abnormally elevated theca cell androgen production is involved in many of the signs and symptoms of PCOS.
- Most society guidelines have accepted that diagnosis of PCOS most meet 2 out of 3 criteria, chronic anovulation, hyperandrogenism (clinical or biological), and polycystic ovaries morphology in the absence of any other pathology. This is well known as Rotterdam criteria. The National Institute of Health requires clinical or biochemical hyperandrogenism and oligo or anovulation. American Excess PCOS Society requires hyperandrogenism with 1 of 2 of the remaining criteria.
- Disorders that mimic the clinical features of PCOS should be excluded. These include thyroid disease, hyperprolactinemia, and nonclassic congenital adrenal hyperplasia with 21-hydroxylase deficiency. Nonclassic congenital adrenal hyperplasia with 21-hydroxylase deficiency requires measurement of serum 17-hydroxyprogesterone [17-OHP]) be done and may require further testing with the adrenocorticotropin stimulation test.
- Theca cells in PCOS have overexpression of most steroidogenic enzymes and proteins involved in androgen synthesis, which suggested a prominent abnormality at the level and activity of steroidogenic enzymes including P450c17, which has been highly identified. Granulosa cells prematurely luteinize primarily as a result of androgen and insulin excess.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Polycystic Ovarian Disease

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## Question 924:

The non-communicable division of the public health department of a newly colonized county is planning to investigate the prevalence of the types of diabetes in an adult population. They gather information on the clinical presentation, a personal and/or family history of autoimmune diseases, body mass index, blood pressure, and a lipid profile. They decide to use a blood test that would measure beta-cell reserves, which, if used with the data from the other clinical information gathered, will help select subjects for confirmatory testing with diabetes-associated autoantibodies (DAA) and classify the various types of diabetes in that population. Which of the following physiological characteristics qualify for the most useful test in this situation?

## Choices:

1. Short half-life, no first-pass metabolism, and steady peripheral clearance
2. Longer half-life, first-pass hepatic metabolism, and varying peripheral clearance
3. Longer half-life, no first-pass metabolism, and steady peripheral clearance
4. Short half-life, first-pass hepatic metabolism, and varying peripheral clearance

## Answer: 3 - Longer half-life, no first-pass metabolism, and steady peripheral clearance

## Explanations:

- The physiological characteristics required in this situation is met by the serum C-peptide. This can be obtained fasting or after stimulation with either glucagon or a mixed meal challenge.
- C-peptide is the fragment that is co-secreted with insulin in equimolar amounts after cleavage of proinsulin and is a measure of beta-cell reserves.
- C-peptide has a serum half-life of 20 -30 minutes, is not subjected to first-pass hepatic metabolism, and has a steady clearance from the peripheral circulation and, therefore, the most useful test in this situation. Serum insulin has the opposite properties and is, therefore, a poor choice.
- Latent autoimmune diabetes of adults (LADA) has some residual C-peptide indicating beta-cell reserve. A stimulated C-peptide test enhances the predictive value; glucagon stimulation is shorter (6 minutes) while a mixed meal test takes 120 minutes. C-peptide is absent in type 1 diabetes mellitus subjects, while it is often raised in type 2 diabetes. In this way, subjects with possible LADA can be identified, and DAA testing can be done on those making the entire study cost-effective. The early cost-effective identification of LADA will help the clinician choose the appropriate medication and improve patient outcomes.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Latent Autoimmune Diabetes

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 925:

A 45-year-old male comes for follow-up for diabetes mellitus and weight management. He has been on glargine insulin 60 units subcutaneous at night and lispro 15 units subcutaneous three times a day before meals. He has been unsuccessful in losing weight. He tried multiple diets and exercises, but he did not achieve significant weight loss. He could not tolerate metformin and semaglutide because of gastrointestinal side effects. Despite his best efforts, his weight persisted at 300 lbs with 36 $Kg/M^2$ BMI. He was referred to a bariatric surgeon, and he underwent gastric bypass surgery 10 days ago. Today his weight is 297 lbs. He denies nausea, vomiting, and abdominal pain. He says that his blood sugars have significantly improved and are running between 140-150 mg/dl. He is scared of using insulin because of fear of hypoglycemia. He has not used insulin since he was discharged from the hospital five days ago. His random blood sugar in the clinic is 136 mg/dl. What is the most likely mechanism for rapid improvement in his glycemic control?

## Choices:

1. Malabsorption of nutrients
2. Lower ghrelin
3. Increased GLP-1 from bypassing of nutrients
4. Beta-cell regeneration

## Answer: 3 - Increased GLP-1 from bypassing of nutrients

## Explanations:

- GLP-1 is secreted from L cells in the ileum and colon by direct contact with nutrients (fat, protein, and glucose) and neuronal input from the upper intestine. GLP-1 has a variety of peripheral and central effects. It has a satiety effect manifested by its blood-borne transfer to the hypothalamus and paracrine fashion action on vagal afferents. It stimulates glucose-dependent insulin release from the pancreas, slows gastric emptying, and inhibits inappropriate glucagon release (inhibits hepatic gluconeogenesis by suppressing glucagon).
- GLP-1 and DPP 4 are novel therapeutic targets in the treatment of diabetes and obesity. GLP-1 levels are lower in obesity, prediabetes, and diabetes. GLP-1 is secreted from L cells in the ileum and colon by direct contact with nutrients (fat, protein, and glucose) and neuronal input from the upper intestine. Patients with type 2 diabetes experience immediate improvement in glycemic control after gastric bypass surgery before weight loss owing to the rise in GLP-1, which is because of bypassing of the small intestine.
- After food intake, the central nervous system, including the hypothalamus, gets nutrient signals from hormones (such as leptin, insulin) that transcend through the blood-brain barrier and vagal afferent signals. The mucosa of the empty stomach secretes ghrelin, and ingestion of food suppresses its release. It has also been called the hunger hormone (orexigenic).
- Insulin also is secreted in proportion to body fat. Leptin and insulin need to cross the blood-brain barrier to signal neuronal networks, including the hypothalamus. Insulin suppresses appetite by inhibiting AgRP/NPY neurons. It is not as potent as leptin in appetite suppression. Obese subjects do not experience this central weight loss effect despite higher levels of insulin owing to insulin resistance.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Physiology, Appetite And Weight Regulation

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## Question 926: A 19-year-old transgender woman presents to the clinic for feminizing therapy. The patient has no history of migraine, breast cancer, or a family history of breast cancer. She is prescribed 400 mg/day spironolactone. Which of the following other medication is most appropriate to be prescribed in this patient?

## Choices:

1. Estrogen
2. Progesterone
3. Cyproterone acetate
4. Testosterone

## Answer: 1 - Estrogen

## Explanations:

- Gender-affirming hormone therapy is a common medical intervention used by transgender individuals. Such treatment allows secondary sex characteristics aligned with an individual's gender identity.
- Hormones are used to suppress male secondary sex characteristics in favor of developing female secondary sex characteristics.
- The approach of therapy is to combine an anti-androgen and estrogen and sometimes add progestogen.
- The estrogen 17-beta estradiol, which is chemically identical to that produced by the ovary, is commonly used for feminizing therapy. The drug is given via cream, oral, sublingual, or transdermal.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Cultural Competence in the Care of LGBTQ Patients

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## Question 927:

A 35-year-old man presents to the office with chest pain that started 2 weeks ago. The pain is pressure-like, worsens with exertion, and rarely relieved with pain medications. However, resting alleviates the pain. He denies nausea, vomiting, diaphoresis, or radiation of the pain. His father died of heart disease at the age of 45 years. His past medical history is unremarkable. His vitals show a temperature of 98.6 F, pulse 86/min, respiratory rate 14/min, and blood pressure 136/84 mmHg. He is in no acute distress. On physical exam, yellowish deposits are noted on his eyelids, with some visible on his Achilles' tendons. Clear breath sounds are noted. Normal S1 and S2 heart sounds are heard, with no murmurs. Jugular venous distention is absent. His abdomen is full, soft, non-tender, and nondistended. Baseline ECG reveals no ST changes. Further workup with an exercise stress test reveals ST depression in the anteroseptal leads, V1, and V2. Which of the following defects is most likely responsible for this patient's condition?

## Choices:

1. Low-density lipoprotein receptor deficiency
2. Apolipoprotein C-II deficiency
3. Decreased lipoprotein lipase
4. Apolipoprotein E deficiency

## Answer: 1 - Low-density lipoprotein receptor deficiency

## Explanations:

- This patient's condition is most likely due to LDL receptor deficiency. The deficiency of this receptor leads to the accumulation of low-density lipoprotein and an increase in blood cholesterol levels. This condition is called familial hypercholesterolemia.
- Patients with this condition are predisposed to premature cardiovascular disease. The inheritance pattern is autosomal dominant.
- In addition to cardiovascular signs and symptoms, other characteristic findings include tendon xanthomas, xanthelasma, and corneal arcus.
- Total blood cholesterol levels vary according to the degree of genetic compromise. Individuals with homozygous traits often have higher cholesterol levels (600 mg/dL up to 1,000 mg/dL) as compared to individuals with heterozygous traits (350-500 mg/dL). Diagnosis is carried out by combining history, physical exam findings, and lipid profile. Treatment involves lifestyle modifications and the use of lipid-lowering medications such as statins, bile acid sequestrants, or niacin.

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## Research Concepts:

### Hypercholesterolemia

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## Question 928:

A 44-year-old woman with a past medical history of uncontrolled type 2 diabetes mellitus presents to the clinic for a follow-up appointment. At her last visit, the patient was found to have a fatty hump in between her shoulders, a rounded face, and concerns about developing hypertension. She was then prescribed mifepristone. Which of the following complications is most likely to occur in this patient?

## Choices:

1. Hypoglycemia
2. Syncope
3. Adrenal insufficiency
4. Increased stimulation of the hypothalamic-pituitary-adrenal (HPA) axis

## Answer: 3 - Adrenal insufficiency

## Explanations:

- At high doses, mifepristone acts as a glucocorticoid receptor antagonist.
- Mifepristone has been approved as a once-daily oral medication (300 mg) to control hyperglycemia secondary to hypercortisolism in adults with endogenous Cushing syndrome and type 2 diabetes or glucose intolerance who have failed surgery or are not candidates for surgery.
- Due to the persistently increased cortisol levels, the HPA axis gets downregulated and can result in adrenal insufficiency.
- Hypoglycemia has not been reported with its use.

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## Research Concepts:

### Mifepristone

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## Question 929:

A 38-year-old male with a prior history of thyrotoxic periodic paralysis presents to the emergency room with sudden onset weakness of both lower extremities. He has 2-3 similar episodes a month. His symptoms usually get better with potassium replacement in the emergency room. His potassium was low at 2.4 on arrival to the emergency room. He received ten meq Intravenous potassium x 4 doses over 4 hours and 40 meq oral potassium x 2 times over 6 hours he was in the emergency room. His weakness has not got any better this time. What is the next best thing to do?

## Choices:

1. Give intravenous potassium boluses
2. Give intravenous steroids
3. Give Iv propranolol
4. Activate code stroke

## Answer: 3 - Give Iv propranolol

## Explanations:

- Hyperadrenergic state has been implicated in the pathogenesis of thyrotoxic periodic paralysis. Use of Iv propranolol has been recommended in the treatment of such patients to suppress the effects of epinephrine.
- In resistant hypokalemic patients Iv propranolol has been shown to improve symptoms by reducing the intracellular shift of potassium and phosphate.
- Non-selective beta-blockers should be used in the treatment of thyrotoxic periodic paralysis patients as selective beta-1 receptor blockers cannot inhibit the bet-2 receptor-mediated hypokalemia caused by epinephrine.
- This patient does not have other signs of acute stroke other than the weakness of both lower extremities. So code stroke is not indicated. Potassium should never be given as a bolus push as it can precipitate arrhythmias. It is usually infused as a piggyback, no more than ten meq per hour through a peripheral line and no more than 20 meq/hour through a central line. Intravenous steroids can make a hypokalemic crisis worse by driving more potassium into the cells

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## Research Concepts:

### Thyrotoxic Periodic Paralysis

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## Question 930:

A 44-year-old man presents to the clinic with constipation. He states he has been constipated for the last few months and has also been having right-sided back pain and general aches and pains. He has no significant medical history, but his sister was recently diagnosed with a pancreatic tumor. Which of the following additional pathologies is most likely to be present in this patient?

## Choices:

1. Lipoma
2. Angiofibroma
3. Ependymoma
4. Pheochromocytoma

## Answer: 2 - Angiofibroma

## Explanations:

- Multiple endocrine neoplasia 1 (MEN1) is an autosomal dominant condition characterized by tumors of the parathyroid glands, anterior pituitary, and pancreatic endocrine cells. While these endocrine neoplasia are the characteristic findings, patients with this condition also have an increased incidence of other non-endocrine abnormalities, including most commonly angiofibromas and collagenomas.
- The most common manifestation of this disease is multiple parathyroid tumors causing hyperparathyroidism, which reaches almost 100% penetrance by age 40-50 year and most commonly presents in the 2nd to 4th decade. This contrasts with primary hyperparathyroidism, which is more common in patients aged 60 years or older.
- The presence of non-endocrine abnormalities can help increase clinical suspicion toward a diagnosis of MEN1, with the combination of three angiofibromas and any collagenomas having a sensitivity of 75% and specificity of 95% for the diagnosis.
- While angiofibromas and collagenomas are most common, a variety of other abnormalities such as lipomas, pheochromocytomas, and ependymomas can be found as well, indicating the need for further evaluation of multiple associated abnormalities in these patients.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Gastrinoma

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## Question 931:

A 4-day-old male infant born to a 25-year-old G1P1 with unremarkable maternal serologies and birth history is brought to the emergency department with new-onset seizure activity. After birth, the patient initiated breast-feeding and was doing well until this morning when he became progressively lethargic and developed generalized tonic-clonic movements. Upon presentation, the patient is afebrile and hemodynamically stable. He is lethargic, has equal and reactive pupils, and a soft and flat fontanelle. His cardiopulmonary examination is unremarkable. After stabilization, further history is obtained, which reveals a history of excessive hiccupping in utero and after birth. Which of the following abnormalities is most often associated with this condition?

## Choices:

1. Deficient activity of an enzyme in the heme synthesis pathway resulting in glycine accumulation
2. Deficient activity of an enzyme resulting in accumulation of organic acid and organic acid metabolites
3. Decreased activity of the enzyme that cleaves glycine resulting in glycine accumulation
4. Deficient in enzyme activity resulting in accumulations of ammonia and the precursor metabolites

## Answer: 3 - Decreased activity of the enzyme that cleaves glycine resulting in glycine accumulation

## Explanations:

- Nonketotic hyperglycinemia is caused by absent or deficient enzyme cleavage activity resulting in glycine accumulation. The abundance of glycine stimulates the N-methyl-aspartate-D-receptor resulting in neuronal damage. Clinical manifestations include encephalopathy and seizure.
- Other metabolic conditions that a clinician should suspect in a neonate recently started on feeds are urea cycle defects. This is secondary to a deficiency in enzyme activity that results in an accumulation of ammonia and its precursor metabolites.
- Organic acidemias (i.e., propionic acidemia) is caused by decreased enzyme activity resulting in the accumulation of organic acid and organic acid metabolites.
- Porphyria is a disease due to the deficient activity of an enzyme in the heme synthesis pathway. It results in the accumulation of heme precursors (porphyrins).

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Nonketotic Hyperglycinemia

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## Question 932:

A 43-year-old Asian male with a history of Graves disease presented to the emergency room with sudden onset of lower extremity weakness. He has a history of asthma and hypertension. He takes amlodipine for hypertension and uses an Albuterol inhaler as needed for his asthma. He is supposed to see an endocrinologist for his Graves disease the following week. He had a recent asthma exacerbation and was started on prednisone and azithromycin. His vitals were within normal limits on arrival. Auscultation of lungs revealed occasional rhonchi. Heart sounds were regular, and no murmurs were heard. Cranial nerve exam was normal. Muscle power showed severe lower muscle weakness. Pertinent labs include normal complete blood count. The potassium level was low at 2.5. Blood urea nitrogen and creatinine were within normal limits. TSH was low at 0.5, and Free T4 was elevated at 6.5. He was diagnosed with Thyrotoxic periodic paralysis and was given potassium replacement. What should you do to prevent immediate recurrence?

## Choices:

1. Give prophylactic potassium replacement during remission to prevent future attacks
2. Emergent thyroid surgery
3. Stop prednisone
4. Prescribe protein supplements

## Answer: 3 - Stop prednisone

## Explanations:

- In skeletal muscles, corticosteroids have been shown to increase Na/K ATPase molecules, thereby precipitating weakness.
- Corticosteroid induced hyperglycemia can stimulate insulin secretion, thereby driving the potassium into the cells, causing hypokalemia in these patients.
- Corticosteroids also prevent the peripheral conversion of T4 to t3.
- Protein supplementation has not been shown to improve symptoms with thyrotoxic periodic paralysis. Prophylactic potassium replacement during remissions has not been shown to prevent recurrent attacks in thyrotoxic periodic paralysis. Androgens, testosterone, and steroids can precipitate periodic paralysis by causing hypokalemia. Clinicians should carefully monitor any drugs that can cause severe hypokalemia in patients with thyrotoxic periodic paralysis.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Thyrotoxic Periodic Paralysis

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## Question 933:

A 39-year-old man has lost 20 kg over the past year due to dieting and exercise regimen. He presents for routine health maintenance. He states that he has regained 2.5 kg over the past two months, which frustrates him. He states that He has been sticking to the diet plan and exercise regimen but has noticed an increase in hunger. He reports needing to take a few extra snacks. Which of the following neurohormonal changes is most likely causing the weight gain in this patient?

## Choices:

1. Increase in leptin levels
2. Loss of inhibition of NPY/AgRP pathway
3. Increase in oxyntomodulin levels
4. Decrease in ghrelin

## Answer: 2 - Loss of inhibition of NPY/AgRP pathway

## Explanations:

- Loss of inhibition of the NPY/AgRP pathway leads to increased hunger and decreased energy expenditure. This results in weight gain.
- A decrease in adipose tissue as a result of weight loss leads to decreased levels of leptin as leptin is produced by the adipose tissue (white).
- Leptin is an inhibitor of the orexigenic pathway (weight gaining pathway), and a decrease in its level contributes to weight gain.
- Leptin stimulates the anorexigenic pathway (POMC neuron system) and inhibits the orexigenic neuron system (NPY/AgRP).

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Physiology, Obesity Neurohormonal Appetite And Satiety Control

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## Question 934:

A 55-year-old patient with obesity and type 2 diabetes mellitus has been complaining of lightning pain, pins and needles sensation in both his legs. He has never been able to control his blood sugars and the neurologist feels that he may have developed peripheral neuropathy. When the pathology of nerves is suspected in patients with diabetes mellitus, which nerve is usually biopsied?

## Choices:

1. Superficial peroneal
2. Anterior tibial
3. Sural
4. Saphenous

## Answer: 3 - Sural

## Explanations:

- The sural nerve is only sensory and it is usually biopsied to look for nerve pathology.
- Sural nerve biopsy is important in the diagnosis of peripheral nerve disease and, in the case of vasculitic neuropathy confined to peripheral nerves, it is the only way of making a certain diagnosis of the treatable condition.
- Sural nerve biopsy has complications of infection, pain, sensory loss, and delayed wound healing. It should only be considered in cases of peripheral neuropathy where there are good prospects of its significantly assisting in the diagnosis.
- The value of biopsy should be weighed against the complications of persistent pain at the biopsy site, infection, and patient dissatisfaction with the procedure.

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## Research Concepts:

### Sural Nerve Biopsy

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## Question 935: A 36-year-old woman with a history of Crohn disease is admitted to the hospital for elective laparotomy and a small bowel stricture resection. She has been taking 12.5 mg prednisolone once a day for the last 6 months to control her disease. Which of the following is the most appropriate perioperative management of her corticosteroid treatment?

## Choices:

1. Usual steroid dose on the morning of surgery and hydrocortisone 50 mg intravenously at induction, followed by 50 mg three times a day by intravenous injection for 24 hours
2. 50mg intravenous hydrocortisone at induction and her usual steroid dose after surgery
3. Usual steroid dose on the morning of surgery and hydrocortisone 50 mg intravenously at induction, followed by 50 mg three times a day by intravenous injection for 48-72 hours
4. Continuation only of 12.5 mg prednisolone once a day

Answer: 3 - Usual steroid dose on the morning of surgery and hydrocortisone 50 mg intravenously at induction, followed by 50 mg three times a day by intravenous injection for 48-72 hours

## Explanations:

- This patient is scheduled to have major elective surgery. During prolonged therapy with corticosteroids, adrenal atrophy develops. Abrupt withdrawal can lead to acute adrenal insufficiency.
- To compensate for diminished adrenocortical response caused by prolonged corticosteroid treatment, there should be a temporary increase in the dose during any significant intercurrent illness, trauma, or surgical procedures.
- For moderate or major surgery: usual oral corticosteroid dose on the morning of surgery and hydrocortisone 25-50 mg intravenously at induction, followed by hydrocortisone 25-50 mg three times a day by intravenous injection for 24 hours after moderate surgery or 48- 72 hours after major surgery; the usual preoperative oral corticosteroid dose is recommenced on stopping hydrocortisone injections.
- For minor surgery, the usual oral corticosteroid dose on the morning of surgery or hydrocortisone 25-50 mg intravenously at induction, the usual oral corticosteroid dose is recommenced after surgery.

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## Research Concepts:

### Corticosteroids

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## Question 936:

A 42-year-old woman presents to the clinic with sudden episodes of palpitations, headache, and sweating. There is no significant past medical history. Physical examination does not reveal any abnormalities. Laboratory assessment shows normal aldosterone and renin, DHEA-S, and 1 mg dexamethasone suppression test. Plasma metanephrines are elevated fourfold. CT scan of the abdomen shows normal adrenal glands. Which of the following is the next best step in the management of this patient?

## Choices:

1. 24-hour urinary metanephrines
2. 24-hour urinary vanillyl mandelic acid
3. MRI abdomen
4. MIBG scan

## Answer: 4 - MIBG scan

## Explanations:

- Pheochromocytomas and paragangliomas are neural crest-derived neoplasms. When located in the adrenal glands, they are termed pheochromocytoma, and paragangliomas are extra-adrenal in location.
- Clinically they are characterized by intermittent episodes of palpitations, headache, and sweating.
- Paragangliomas are diagnosed by an MIBG scan. Paragangliomas occur in close proximity from the skull to the pelvis, close to sympathetic and parasympathetic chains.
- The first line of treatment of paragangliomas in surgical excision.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Nuclear Medicine Endocrine Assessment, Protocols, And Interpretation

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## Question 937:

A 65-year-old woman presents with intermittent upper abdominal pain for the last six months. Her past medical history includes type 2 diabetes mellitus that was diagnosed one month ago and hypertension. She is currently taking enalapril and furosemide. Her family history is significant for cholangiocarcinoma on her father's side. All her vital signs are within normal limits. Her body mass index (BMI) is 30 kg/m2. On examination, slight yellowing of her eyes is seen, and a red-blue linear streak is seen on her left forearm. An ultrasound scan of her abdomen is performed. Which of the following could be seen on ultrasound to establish the underlying condition in this patient?

## Choices:

1. Double-duct sign
2. Double-bubble sign
3. Triple-bubble sign
4. Water lily sign

## Answer: 1 - Double-duct sign

## Explanations:

- This patient presents with signs and symptoms of pancreatic carcinoma. This is supported by her recent-onset diabetes mellitus, jaundice, and Trousseau sign (red-blue linear streak).
- On ultrasound, there is dilatation of the common bile duct and the pancreatic duct in cases of pancreatic head cancer. These two dilatations are seen as a double-duct sign.
- Multidetector computed tomography (MDCT) is the best imaging modality to diagnose and evaluate the extent of disease, including perivascular extension and distant metastasis. Positron emission CT scan can be useful in detecting distant metastatic disease.
- Double-bubble sign is seen in duodenal atresia. Triple-bubble sign is seen in jejunal atresia. Water-lily sign is seen in the hydatid cyst.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Pancreatic Cancer

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## Question 938:

A 47-year-old woman with a past medical history of poorly controlled diabetes, hyperlipidemia, and chronic alcohol use is hospitalized for altered mental status. On physical examination, the patient slurs her words and is visibly intoxicated. She appears clinically euvolemic, has normal vital signs, and unremarkable cardiorespiratory and abdominal examinations. Laboratory studies in the emergency department are notable for a serum glucose of 255 mg/dL (70 – 100 mg/dL), a serum sodium level of 125 mEq/L (135 – 145 mEq/L), and a serum osmolality of 292 mOsm/kg H2O (280 – 300 mOsm/kg H2O). What is the most appropriate next step in the management of this patient's hyponatremia?

## Choices:

1. Measure urine sodium level
2. No further workup is necessary
3. Repeat serum sodium measurement with direct ion-selective electrode potentiometry (DISE)
4. Administer intravenous isotonic saline

## Answer: 3 - Repeat serum sodium measurement with direct ion-selective electrode potentiometry (DISE)

## Explanations:

- The correct answer is to repeat the serum sodium measurement with direct ion-selective electrode potentiometry (DISE). The patient presents with isotonic hyponatremia that is consistent with a diagnosis of pseudohyponatremia. Pseudohyponatremia is the result of laboratory artifact in the presence of excess solutes in the serum that alter how modern laboratory methods interpret serum sodium levels. Approximately two-thirds of medical laboratories in the United States utilize a method of sodium analysis called indirect ion-selective electrode potentiometry (IISE), which is prone to this type of error.
- Detection of serum sodium levels by use of DISE can avoid this issue, although in most cases DISE is not necessary as the diagnosis is obvious from the patient's medical history.
- In most cases of pseudohyponatremia, using direct ion-selective potentiometry (DISE) is not needed, as the etiology can be readily ascertained from the patient's past medical history. However, under circumstances where there are multiple confounding variables, such as the presence of hyperlipidemia and hyperglycemia, DISE analysis is a recommended next step.
- A urine sodium level is not helpful in cases of isotonic hyponatremia, as this does not indicate a true hyponatremic condition. Intravenous isotonic saline is not indicated in pseudohyponatremia and can worsen an underlying hyponatremic condition if one is present. Further laboratory workup is recommended to avoid iatrogenic injury.

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## Research Concepts:

### Pseudohyponatremia

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## Question 939:

A 66-year-old male presents with a 1-year history of progressively severe diarrhea, abdominal bloating, and diffuse abdominal pain. Over the past 1-2 months, he had noted a progressive sensation of muscle weakness and cramping. Vital signs are within normal limits. Neurologic exam is notable for a positive Chvostek sign and positive Trousseau sign. The abdomen is soft, non-tender, and non-distended. Vital signs are within normal limits. Laboratory studies reveal hemoglobin of 8.1 g/dL (normal 13.8-17.2 g/dL), a mean corpuscular volume of 72 fl (normal is 80-100 fl), serum 25-hydroxyvitamin D is undetectable (normal >30 ng/ml). A subsequent endoscopic duodenal biopsy reveals villous atrophy and crypt hyperplasia. A colonoscopy reveals mild diverticulosis. Which of the following lab findings are expected to be present in this patient?

## Choices:

1. An increased ionized calcium level
2. An increased parathyroid hormone level
3. An increased alkaline phosphatase level
4. A decreased alkaline phosphatase level

## Answer: 2 - An increased parathyroid hormone level

## Explanations:

- This patient has celiac disease with malabsorption of vitamin D.
- In patients with malabsorption of vitamin D, signs and symptoms of hypocalcemia can subsequently result, as seen in this patient.
- In patients with vitamin D malabsorption and subsequent hypocalcemia, compensatory secondary hyperparathyroidism and subsequent increased bone turnover can result in the body's attempt to maintain normal serum calcium levels.
- Villous atrophy and crypt hyperplasia are seen on biopsy in patients with celiac disease; biopsy samples are typically taken from the duodenum as this is the stereotypical site affected.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Osteoporosis Markers

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## Question 940:

A 45-year-old male presents to the clinician complaining of pain throughout his body for the past couple of weeks. He states the pain is more pronounced in his long bones. Upon further questioning, he reveals that he also has nausea and vomiting for the past couple of days and that he feels drained lately, and his mood has been sad. The rest of his history is non-contributory. His family history is significant for pancreatic cancer in his father at the age of 60. Further evaluation of labs reveals a sodium concentration of 140 mEq/L, a calcium concentration of 14.5 mg/dL, and a potassium of 4 mEq/L. Which of the following is the most likely cause of the patient's symptoms?

## Choices:

1. Solid tumor malignancy
2. Vitamin D toxicity
3. Granulomatous disease
4. Pituitary adenoma

## Answer: 1 - Solid tumor malignancy

## Explanations:

- Hypercalcemia is defined as serum calcium concentration, two standard deviations above the mean values. The normal serum calcium ranges from 8.8 mg/dL-10.8 mg/dL.
- The patient in the given scenario is experiencing symptoms of hypercalcemia, which can be summarized as "groans, bones, stones, moans, thrones and psychic overtones." This includes abdominal pain, nausea, vomiting, bone pain, fatigue, malaise, polyuria, polydipsia, constipation, lethargy, confusion, depression, and memory loss.
- Calcium levels over 14 mg/dL are associated with malignancy. In patients with hypercalcemia associated with malignancy, the PTH (parathyroid hormone)-related peptide levels are elevated. The PTH-related peptide increase levels of calcium by causing activation of the parathyroid hormone receptor, excessive bone resorption, and increased reabsorption of calcium from the distal convoluted tubules of the kidneys.
- Given the patient's family history of pancreatic cancer and current symptomatic hypercalcemia, a solid tumor malignancy is the most likely cause of the patient’s high calcium levels and warrants investigation.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hypercalcemia

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## Question 941:

An 11-year-old boy had a routine screening lipid profile due to universal screening guidelines that state children between the ages of 9 and 11 should have a least one lipid profile. His vital signs and physical exam are unremarkable. The boy's LDL cholesterol is 188 mg/dL, and his total cholesterol is 235 mg/dL. The mother reports the child's father had a myocardial infarction at age 43 years. Which of the following is the next best step in the evaluation of this patient?

## Choices:

1. Genetic testing for ABCG5/G8
2. Measurement of serum plant stanol levels
3. Follow multi-society guidelines and monitor without treatment
4. Trial of ezetimibe

## Answer: 1 - Genetic testing for ABCG5/G8

## Explanations:

- Genetic testing for ABCG5 or ABCG8 mutations is the definitive test for sitosterolemia.
- Measurement of plant stanol levels can be affected by medication, diet, or physiologic conditions such as cholestasis.
- Multi-society guidelines state for persistently elevated LDL-cholesterol greater than 160 mg/dL, consideration of treatment or further work-up is indicated for those with multiple risk factors.
- A trial of ezetimibe or a statin does not provide a definitive diagnosis.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hereditary Sitosterolemia

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## Question 942:

A 36-year-old man with a history of morbid obesity is enrolled in a clinical trial evaluating the effects of atrial natriuretic peptide (ANP) among patients with metabolic syndrome. Which of the following best explains the mechanism of the role of ANP on insulin sensitivity?

## Choices:

1. Decreasing skeletal muscle fat oxidation
2. Increasing skeletal muscle fat oxidation
3. Increased storage of lipids within white adipose tissue
4. Decreased plasma release of adiponectin

## Answer: 2 - Increasing skeletal muscle fat oxidation

## Explanations:

- The natriuretic peptides, including atrial natriuretic peptide (ANP), increase skeletal muscle fat oxidation or break down.
- ANP also increases lipid mobilization within white adipose tissue.
- ANP stimulates the increase of adiponectin levels, which have regulating effects on glucose and lipid metabolism as well as cardioprotective properties.
- ANP exerts its effects by increasing skeletal muscle fat breakdown, increasing lipid mobilization, and increasing adiponectin levels, which ultimately leads to decreased insulin sensitivity. This is the opposite effect seen in diabetes, and therefore it is postulated that low ANP levels can be predictive of diabetes.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Atrial Natriuretic Peptide

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## Question 943:

A 25-year-old man was recently diagnosed with MEN2 mutation during the workup for panic attacks, his family history is also positive for the same mutations in his grandfather and father. The MRI showed a lesion in patient's neck, a biopsy of the lesion was done and the results are pending, which are the characteristics of the top differential in this scenario?

## Choices:

1. Most are benign
2. Always lie below the diaphragm
3. Most are familial
4. Most are bilateral

## Answer: 1 - Most are benign

## Explanations:

- Paragangliomas are very rare, slow-growing hypervascular tumors within the jugular foramen. Most are benign, although some may become malignant, and only distant metastases can reliably confirm the malignant potential of these tumors.
- These tumors may also occur at the carotid body and in the ear.
- Paragangliomas occur in the 5th decade of life and are more common in women.
- Most of the familial tumors are bilateral (10-20%) in contrast to unilateral sporadic tumors (1%).

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## Research Concepts:

### Paraganglioma

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## Question 944:

A 30-year-old woman presents with complaints of amenorrhea and white nipple discharge for the past three months. She also complains of headaches and visual changes. She has no past medical history and currently takes no medications. Her vital signs show an oxygen saturation 98% on room air, respiratory rate 14 per minute, heart rate 82 beats per minute, blood pressure 130/75 mmHg, and temperature 98.6 F (37 C). Physical examination reveals bitemporal hemianopsia. Neuroimaging reveals a 1.8 cm pituitary mass abutting the optic chiasm. Which of the following is an appropriate treatment strategy?

## Choices:

1. Treatment with oral dopaminergic agonist
2. Treatment with an oral dopaminergic antagonist
3. Transcranial resection of the tumor
4. Transsphenoidal resection of the tumor

## Answer: 1 - Treatment with oral dopaminergic agonist

## Explanations:

- The most likely diagnosis is a prolactinoma. Prolactinomas clinically present because of the mass effect (visual changes) of the tumor or because of hyperprolactinemia (amenorrhea, loss of libido).
- Microprolactinomas (less than 1 cm) can present with symptoms of hyperprolactinemia or are detected incidentally on neuroimaging done for other reasons. Macroprolactinomas, on the other hand, present with mass effects on the surrounding structures.
- The preferred treatment for prolactinomas is medical therapy. Cabergoline and bromocriptine are two commonly used dopamine agonists.
- Transsphenoidal surgery is preferred and is indicated for unsuccessful medical therapy to lower prolactin levels and decrease tumor size after several months of maximum dose. It can also be considered in a female with a large prolactinoma (more than 3 cm) who wishes to become pregnant.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Prolactinoma

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## Question 945:

A 65-year-old gentleman presents to the emergency department with an altered sensorium after having multiple seizures at his home. A review of medical records indicates that he has never been diagnosed with epilepsy, and they also do not indicate any regular medications, other than a recent infusion of zoledronic acid. He has no documented osteoporosis or thyroid dysfunction. His pulse rate is 40 beats/min, blood pressure is 86/40 mmHg, oxygen saturation is 97% at room air, and respiratory rate is 14 breaths/min. His clinical examination reveals a cold, clammy skin and bilateral facial muscle spasms, a post-ictal state, with no obvious focal neurological deficits. His deep tendon reflexes are brisk. His electrocardiography (ECG) shows a prolonged QT interval. His laboratory investigations show serum corrected calcium at 1.6 mmol/L (normal range is 2.1 to 2.5 mmol/L). Which condition is most likely to be associated with this presentation?

## Choices:

1. Hypoparathyroidism
2. Sarcoidosis
3. Familial hypocalciuric hypercalcemia
4. Lung Cancer

## Answer: 1 - Hypoparathyroidism

## Explanations:

- He has a history of recent bisphosphonate use, which can lead to hypocalcemia in patients with subclinical hypoparathyroidism. Hypoparathyroidism is due to deficiency or impaired activity of parathyroid hormone (PTH), which leads to decreased serum levels of calcium and increased levels of phosphorus.
- Hypocalcemia can also occur with bisphosphonates. Its symptoms may include impaired sensations, muscle spasms, seizures, or cardiac arrest.
- Severe hypocalcemia can manifest as seizures. It can lead to a positive Trousseau sign and Chvostek sign. Chvostek sign is elicited by tapping the inferior portion of the cheekbone, which produces facial spasms.
- Calcium is also a chronotropic and ionotropic agent, and hypocalcemia can present like cardiogenic shock.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Bisphosphonate

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## Question 946:

A 48-year-old patient was brought to the emergency department by an ambulance after being involved in a motor vehicle collision and suffering multiple facial and orthopedic injuries. Upon arrival in the emergency department, after the initial evaluation, he was intubated and has had multiple procedures over the past two days. In the intensive care unit, labs are drawn. Results indicate a thyroid-stimulating hormone level of 0.4 mU/L, a T4 level of 7 ug/dL, and the T3 level of 0.5 ng/dL. Which of the following is the next best step in the management of this patient?

## Choices:

1. Start thyroid replacement
2. I131 nuclear medicine scan
3. Observation
4. Start dexamethasone

## Answer: 3 - Observation

## Explanations:

- Any severe acute illness can cause sick euthyroid syndrome.
- It is thought to be caused by circulation cytokines. The decreased T3 is thought to limit catabolism.
- Thyroid hormone replacement is not needed in patients with the euthyroid sick syndrome. Treatment and management of underlying medical illness is the focus; however, periodic monitoring of thyroid function should be done while the patient is in the hospital.
- After discharge from the hospital, thyroid function abnormalities may persist for several weeks. In a clinically euthyroid patient, thyroid function tests should be repeated six weeks after hospitalization to confirm overt thyroid dysfunction with persistent TSH abnormality or confirm euthyroid sick syndrome with normalization of TSH.

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## Research Concepts:

### Euthyroid Sick Syndrome

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## Question 947:

A 65-year-old male presents to the clinic as a new patient for concerns of hyperlipidemia. His medical history includes type 2 diabetes mellitus and hypertension, and his medications include metformin 500 mg daily and losartan 20 mg daily. The patient reports drinking 6 beers a week and is a former tobacco user with a 20 pack-year history, quitting 10 years ago. He also reports spending 30 minutes each day walking. Vital signs are as follows: blood pressure is 135/87, heart rate is 86, respiratory rate is 18, and oxygen saturation is 94% on room air. BMI is 30. Physical exam reveals that the patient appears mildly overweight, but otherwise unremarkable. The patient recently completed a lipid panel as a part of his annual labs, which reported LDL of 130, HDL of 30, triglycerides of 150, and total cholesterol of 180. Based on these results, what cholesterol-lowering medication is most suitable for the patient?

## Choices:

1. Niacin
2. Ezetimibe
3. Fish oil
4. Statin medication

## Answer: 4 - Statin medication

## Explanations:

- The mechanism of action involved in statin medications is that it is able to deplete stores of cholesterol in the intrahepatocyte which therefore reduces the overall amount of LDL particles that are circulating in comparison to the total number of plasma cholesterol.
- The decreased amount of circulating plasma cholesterol contributes to a reduction in LDL from anywhere from 30% to 50%.
- In patients aged 40-75 years of age with diabetes mellitus, who have an LDL of greater to or equal to 70, it is recommended that the patient be started on moderate-intensity statin therapy.
- In patients aged from 50-75 years of age who have diabetes mellitus and have further health complications, a high-intensity statin is recommended to reduce LDL by = 50%.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### How Can I Help My Patients With Type 2 Diabetes Mellitus Minimize Cardiovascular Disease Risk?

We update eBooks quarterly and Apps daily based on user feedback. Please tap flag to report any questions that need improvement.

## Question 948:

A 34-year-old man is brought to the emergency department with complaints of recent onset lethargy and difficulty walking. His wife also mentions that he has had a few episodes of vomiting and has been experiencing reduced appetite for the past week. Further questioning reveals that he suffered from a bout of gastroenteritis last week from which he is still recovering. Clinical evaluation reveals a tired-looking individual in apparent distress with dry mucous membranes. Laboratory testing reveals elevated urinary alpha-ketoacids and elevated plasma levels of allo-isoleucine, valine, and leucine. The laboratory technician also mentions that the urine specimen has a burnt caramel-like odor. Furthermore, in vivo testing reveals a branched-chain ketoacid dehydrogenase activity of 12% of normal. Which of the following is the most likely diagnosis in this patient?

## Choices:

1. Thiamine responsive maple syrup urine disease
2. Intermediate maple syrup urine disease
3. Intermittent maple syrup urine disease
4. Classic maple syrup urine disease

## Answer: 3 - Intermittent maple syrup urine disease

## Explanations:

- Intermittent maple syrup urine disease has a variable age of onset. Affected individuals usually have a normal period of growth and development during neonatal and most of adolescent life. Patients usually have a branched-chain ketoacid disease (BCKAD) residual activity level at 5%-20% of normal. In this scenario, our patient has a BCKAD residual activity level 12% of normal.
- These patients are normally asymptomatic. However, they may experience worsening of symptoms due to an acute illness or burden such as fever, trauma, infection, surgery, exercise, or dehydration. Our patient has recently suffered a bout of gastroenteritis from which he is currently recovering. Such states exacerbate the underlying ketoacidosis and increase the caloric requirements of the body resulting in an acute metabolic decompensation.
- During an acute illness, patients may present with lethargy, ataxia, seizures, and coma. However, patients may also develop signs and symptoms of classic maple syrup urine disease such as opisthotonus, dystonias, central respiratory failure, coma, and maple syrup odor of cerumen or urine.
- Patients with intermittent maple syrup urine disease who undergo acute metabolic decompensation must be immediately hospitalized for urgent care. The goals of in-hospital treatment include effectively treating the underlying stressor, control nausea and vomiting, reduce leucine concentrations, provide suitable estimated energy requirements, and provide appropriate nutritional and metabolic support.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Maple Syrup Urine Disease

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## Question 949: A 53-year-old man with a past medical history of hypertension and type 2 diabetes mellitus who has recently been diagnosed with chronic hepatitis C infection is beginning interferon and ribavirin therapy in 1 week. The patient had a complete blood count and comprehensive metabolic panel checked by his gastroenterologist last week, which was normal. Which of the following is the next best step in the evaluation of this patient?

## Choices:

1. Ammonia level
2. Hemoglobin A1c
3. Ultrasound of the abdomen
4. Reassure patient that he requires no additional testing

## Answer: 2 - Hemoglobin A1c

## Explanations:

- This patient has a history of diabetes.
- Patients who have diabetes should be advised to achieve strict control of the blood sugars when they are on interferon, and ribavirin treatment as the presence of insulin resistance reduces the chance of achieving viral eradication and renders treatment less effective.
- Therefore, hemoglobin A1c should be checked in this patient.
- Ammonia level is usually checked for patients who have advanced liver disease and are presenting with hepatic encephalopathy. Many times low platelets, anemia, and abnormal aminotransferase levels on labs are found. This patient had a normal complete blood count and a normal comprehensive metabolic panel just 1 week back. Also, he is not having any altered mental status and does not seem to have any evidence of advanced liver disease. Ultrasound of the abdomen is not required in this patient as it would not provide any additional information that would change the treatment plan. Ultrasound can be done if the patient is having any abdominal pain or if there is a concern for cirrhosis. This patient is not having any abdominal pain. He also does not have any evidence of cirrhosis clinically. His labs are completely normal otherwise.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hepatitis

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## Question 950:

A 65-year-old male suffering from chronic shoulder pain is undergoing inguinal hernia repair. During the case, the patient's mean arterial pressure is becoming increasingly difficult to maintain above a goal of 65 mmHg. There is no significant blood loss. The end-tidal CO2 (ETCO2) monitor reads a normal output of 35 mmHg, which has been stable throughout the case. The blood pressure cuff is securely in place. The patient's home medications include over-the-counter tylenol, and 20 mg oxycodone daily. What is the most likely cause of these patient's hemodynamic instability?

## Choices:

1. Hemodynamic monitor failure
2. Decreased cardiac output
3. Impaired adrenal output
4. Massive blood loss

## Answer: 3 - Impaired adrenal output

## Explanations:

- Multiple case reports support the link between long-term opioid use and opioid-induced adrenal insufficiency, which can predispose a patient to an eventual adrenal crisis, also known as an addisonian crisis when under an adequate amount of physiologic stress, this case being surgery.
- Opioids agonists of all classes act as feedback inhibitors on the hypothalamic-pituitary-adrenal axis (HPA). Opioid use exceeding a duration of 1 month, regardless of dosage, is sufficient to increase the risk for developing opioid-induced adrenal insufficiency.
- Opioid-induced adrenal insufficiency has been well established in the chronic pain patient population, and best explains this patient's hemodynamic compromise.
- Massive blood loss is unlikely. Hemodynamic monitor failure is unlikely as the patients' blood pressure cuff is securely in place. Decreased cardiac output is unlikely as the ETCO2 monitor reads a normal range and stable output.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Opioid-induced Endocrinopathy

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## Question 951:

A 45-year-old female with a history of seizures that was well controlled with valproic acid presents to the office. The patient developed type 2 diabetes mellitus after being seizure-free with no changes occurring in her valproic acid over that time period. The practitioner started an oral medication to help control postprandial sugars levels. The patient started to experience severe flatulence and diarrhea. Three months after starting the medication, she was found to have elevated serum transaminases and had 2 seizures during that time period after being seizure-free for the past 5 years. What is the likely mechanism of action of the drug prescribed by the practitioner?

## Choices:

1. Increases insulin release from pancreatic beta-cells
2. Decreases glucose production by the liver
3. Increases insulin sensitivity in peripheral tissues
4. Slows the digestion of ingested carbohydrates

## Answer: 4 - Slows the digestion of ingested carbohydrates

## Explanations:

- Acarbose inhibits pancreatic alpha-amylase and intestinal alpha-glucoside hydrolase in the brush borders of the small intestines which result in the slowing of digestion of complex carbohydrates which results in decreased glucose absorption. Diarrhea and flatulence is a commonly observed side effect.
- Acarbose usually does not lead to hypoglycemia when administered as monotherapy. It is important to treat hypoglycemia with oral glucose (dextrose) and not sucrose (table sugar) since the hydrolysis of sucrose and fructose is inhibited by acarbose.
- Acarbose may decrease the bioavailability of digoxin and valproic acid
- Acarbose helps lower postprandial rise of blood sugar levels.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Acarbose

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## Question 952:

A 70-year-old man is brought in by his sister and has a history of suicidal thoughts and weight loss. Detailed history reveals progressive weakness and weight loss of 20 pounds (9 kg) over the past 6 months. The patient has been feeling depressed and has had suicidal thoughts several times. He also experiences intermittent diarrhea and occasional palpitations over the same period. He states that his rheumatism bothers him a lot. The patient has a 50-pack per year history of smoking. Otherwise, his past medical history is insignificant. Medications include bupropion for depression and over-the-counter ibuprofen for rheumatism as needed. He lives alone. His wife died 5 years ago. Physical examination reveals a thin man with a flat affect. The rest of the physical exam is normal. Laboratory values show a hematocrit of 32% and a white blood cell count of 6,300/$mm^3$ with a normal differential. The platelet count is 100,000. The erythrocyte sedimentation rate is 30. The chemistry profile is normal. Calcium levels are 11.4 mg/dL. ECG is normal. What is the most probable diagnosis?

## Choices:

1. Bronchogenic carcinoma
2. Hyperthyroidism
3. Hypothyroidism
4. Polymyalgia rheumatica

## Answer: 2 - Hyperthyroidism

## Explanations:

- This patient has the variant of hyperthyroidism known as apathetic hyperthyroidism, which was first described by Lahey.
- Apathetic hyperthyroidism is more often seen in elderly patients but has been described in all age groups. Patients present usually with apathy, weight loss, arrhythmias (especially atrial fibrillation), congestive heart failure, and diarrhea.
- These patients also have hypercalcemia, anemia, and thrombocytopenia. Hypothyroidism presents with weight gain and depression.
- Low ESR rules out polymyalgia rheumatica. The key to the diagnosis is occasional palpitations, which are not a feature of any other differential given.

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## Research Concepts:

### Hyperthyroidism

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## Question 953:

A 45-year-old man with poorly controlled hypertension was recently diagnosed with acromegaly when the healthcare provider noticed the typical coarsening of his facial features, enlarged hands, and feet. He did not want surgery and therefore is being medically managed with a somatostatin analog and is biochemically well controlled. He still says he feels exhausted throughout the day, and his wife mentions she is tired too because his snoring keeps her up at night. His blood pressure in the office is 168/92 mmHg and 160/90 mmHg on repeat measurement. He is currently on three antihypertensive agents. What is the next step in management?

## Choices:

1. Add a fourth antihypertensive agent
2. Refer for pituitary surgery
3. Referral for a sleep study
4. Observe and bring back for a blood pressure check

## Answer: 3 - Referral for a sleep study

## Explanations:

- The patient has acromegaly and therefore is at high risk for sleep apnea and therefore should be referred for a sleep study with symptoms concerning for such and a high STOP-BANG score.
- Even though acromegaly can result in uncontrolled hypertension, this patient has biochemically controlled acromegaly with medical management. Thus complications associated with acromegaly need to be considered a possible cause of his uncontrolled hypertension; the most likely in this patient is obstructive sleep apnea.
- Obstructive sleep apnea occurs in patients with acromegaly mainly due to anatomical reasons involving enlargement of soft tissue and craniofacial changes (peripheral). A small proportion of these patients can also have central sleep apnea.
- Although additional antihypertensive management may be required, looking for a potentially treatable underlying cause for this patient's uncontrolled hypertension is appropriate, especially since obstructive sleep apnea can cause other deleterious effects, especially cardiovascular, if left untreated.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Acromegaly

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## Question 954:

A 30-year-old primigravida woman presents to the clinic at 20 weeks of gestation for a prenatal visit. She currently has no complaints. Her vitals are pulse 70/min, blood pressure of 150/100 mm Hg, the temperature of 98 F, and respiratory rate of 18/min. Ultrasound of the uterus done during the visit shows diverging horns of the uterus. Which of the following is very important to assess during her visit to determine the cause for the high blood pressure of this patient?

## Choices:

1. Adrenal gland
2. Gastrointestinal tract
3. Kidneys and urinary tract
4. Aorta

## Answer: 3 - Kidneys and urinary tract

## Explanations:

- Mullerian anomalies like bicornuate uterus can be associated with obstetric complications like pregnancy-induced hypertension, preterm labor, or postpartum hemorrhage.
- Mullerian duct anomalies are frequently associated with renal tract anomalies as the development of kidneys from the metanephros due to induction from the ureteric bud from the mesonephric duct is linked to the development of the paramesonephric duct.
- Thus it is very important to assess the urinary tract in females with Mullerian anomalies to avoid complications like preeclampsia during pregnancy.
- The most common association is unilateral agenesis with uterus didelphys. However, other anomalies like horseshoe kidney ectopic ureters can also be found.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Bicornuate Uterus

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## Question 955:

A 16-year-old female presents with irregular menstrual cycles for a month. A review of the system is positive for fatigue and excess body hair. Vital signs are blood pressure 121/78 mmHg, pulse 74/min, respiratory rate 16 breaths/min, BMI 32.8 kg/m2. Physical examination reveals an obese female with facial acne and acanthosis nigricans. Given the most likely clinical suspicion, which of the following tests are the best for an initial evaluation?

## Choices:

1. Glucose, insulin, C-peptide, beta-hydroxybutyrate, proinsulin, sulfonylurea, and meglitinide screen
2. TSH, FSH, LH, prolactin, bHCG, free testosterone level
3. Morning cortisol level
4. TSH, free T4, anti-TPO, TSI

## Answer: 2 - TSH, FSH, LH, prolactin, bHCG, free testosterone level

## Explanations:

- Polycystic ovarian syndrome (PCOS) usually presents with hyperandrogenism, hyperinsulinemia, menstrual irregularities, diabetes, heart disease, and high lipidemia.
- Most guidelines have accepted that diagnosis of PCOS must meet 2 out of 3 criteria; chronic anovulation, hyperandrogenism (clinical or biological), and polycystic ovaries morphology in the absence of any other pathology. This is known as Rotterdam criteria. The National Institute of Health requires clinical or biochemical hyperandrogenism and oligo or anovulation. The American Excess PCOS Society requires hyperandrogenism with one or 2 of the remaining criteria.
- Disorders that mimic the clinical features of PCOS should be excluded. These include thyroid disease, hyperprolactinemia, and nonclassic congenital adrenal hyperplasia with 21-hydroxylase deficiency. Nonclassic CAH requires the measurement of serum 17-hydroxyprogesterone [17-OHP] for diagnosis. Patients may require further testing with the adrenocorticotropin stimulation test.
- The diagnosis of PCOS in adolescents is particularly challenging, given significant age and developmental issues in this group. Many features of PCOS, including acne, menstrual irregularities, and hyperinsulinemia, are common in normal puberty. Menstrual irregularities with anovulatory cycles and varied cycle lengths are common due to the immaturity of the hypothalamic-pituitary-ovarian axis in the 2- to 3-year time period post-menarche. Persistent oligomenorrhea 2 to 3 years beyond menarche predicts ongoing menstrual irregularities and greater likelihood of underlying ovarian or adrenal dysfunction. In adolescent girls, large, multicystic ovaries are a common finding, so ultrasound is not a first line investigation in women.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Polycystic Ovarian Disease

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## Question 956: A 58-year-old woman with a history of type 1 diabetes mellitus for the last 20 years presents to the clinic with swelling of the legs, puffy appearance of the face, increased abdominal girth, and shortness of breath. She has been prescribed insulin for glycemic control but is non-compliant with therapy. On examination, her legs are shiny, swollen, devoid of hair, and have pitting edema. The left big toe has been amputated because of diabetic complications. Chest auscultation reveals bilateral basal crepitations. Investigations show that she has hyperkalemia, increased urea and creatinine, and a GFR of less than 20 ml/min. The patient is prepared for dialysis. What is the most appropriate long-term treatment of this patient?

## Choices:

1. SPK (simultaneous pancreas and kidney transplant)
2. PAK (pancreas after kidney transplant)
3. PTA (pancreatic transplant alone)
4. Life long dialysis

## Answer: 1 - SPK (simultaneous pancreas and kidney transplant)

## Explanations:

- Simultaneous pancreas and kidney transplant (SPK) is now the first choice of treatment in a patient with type 1 diabetes mellitus and related end-stage renal disease.
- SPK is performed in insulin-treated patients with diabetes with an end-stage renal disease with GFR less than 20 ml/min or on dialysis. There is increasing evidence that SPK is associated with improved quality of life, although it is never subjected to a randomized control trial.
- Indication for pancreas transplant alone is type 1 diabetes mellitus patients with frequent and severe episodes of hypoglycemia. They may have impaired quality of life or be non-compliant with insulin therapy due to some other reasons. These patients have an adequate renal function and no uremia. Patients who have a glomerular filtration rate of 80–100 mL/min/1.73 m are unlikely to need a kidney transplant.
- PAK is done in patients with insulin-treated diabetes having a stable function of previous renal allograft and who meet criteria for PTA.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Pancreas Transplantation

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## Question 957:

A 75-year-old male presents to the clinic for follow-up after being admitted to the hospital for newly diagnosed congestive heart failure. Today, he reports being mildly short of breath but does not exhibit conversational dyspnea. The patient has a medical history of type 2 diabetes mellitus and hyperlipidemia. The patient's medications include metformin 500 mg BID and dapagliflozin 10 mg. The patient reports eating fast food 5 times each week and denies tobacco use and reports he drinks one glass of wine nightly. He states that he is mostly sedentary even before his hospital admission. Vital signs are as follows: blood pressure is 130/85, heart rate is 85, respiratory rate is 18, and oxygen saturation is 97% on room air. Upon physical exam, the patient is not in any distress and there is trace edema in his lower extremities bilaterally. According to the patient's limited history, what is lifestyle change the patient would be recommended to decrease his cardiovascular risk?

## Choices:

1. Splitting his dapagliflozin medication by taking half the dose in the morning and the other half in the evening.
2. Dietary changes include increasing potassium and limiting sodium to 2400 mg daily.
3. Limiting daily sodium intake to less than 3000 mg daily.
4. Increasing alcohol intake to 2 glasses of wine each night.

## Answer: 2 - Dietary changes include increasing potassium and limiting sodium to 2400 mg daily.

## Explanations:

- Non-pharmacological treatments to lower blood pressure include dietary lifestyle adjustments in the form of the DASH diet (Dietary Approaches to Stop Hypertension).
- The DASH diet recommends limiting sodium to 2400mg daily with an increase of potassium in the diet.
- Additional recommendations of the DASH diet include a diet rich in fruits and vegetables and recommends low-fat dairy.
- The American Diabetes Association has current recommendations for weight loss in patients with type 2 diabetes and even further recommends low fat and calorie-restricted diets.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### How Can I Help My Patients With Type 2 Diabetes Mellitus Minimize Cardiovascular Disease Risk?

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## Question 958:

A 37-year-old nurse attends the clinic concerned about her glycemic control. She has type 2 diabetes mellitus and monitors her HBA1c at home. She currently takes metformin 1 g daily; however, her HBA1c is 72 mmol/mol (8.7%). Her past medical history includes asthma, for which she takes a salbutamol inhaler, and recurrent urinary tract infections, for which she is regularly prescribed trimethoprim. She is of normal weight, which she ascribes to eating erratically when she is on shift. Which element of her history would support the clinician's decision to prescribe repaglinide as a second-line therapy?

## Choices:

1. A history of asthma
2. Regular use of trimethoprim
3. Young age
4. Erratic meal times

## Answer: 4 - Erratic meal times

## Explanations:

- Repaglinide is an oral antihyperglycemic drug used in an adult patient with type 2 diabetes mellitus. Repaglinide produces an initial insulin response to meals reducing postprandial blood glucose levels. It should only be taken with food, and meal-time doses should be skipped with any skipped meal.
- Repaglinide is often recommended as a second-line agent in patients experiencing poor glycaemic control with an erratic lifestyle. The quick onset and short duration of action of repaglinide make it appropriate for these patients, as they may take it approximately 30 minutes before a meal for it to be effective.
- These aspects of repaglinide's pharmacokinetic profile are what separate it from the similar-acting sulfonylureas. It binds the SUR1 receptor with weaker affinity than sulfonylureas and thus is also less likely to produce hypoglycemia.
- Mild asthma is not implicated in the management of type 2 diabetes mellitus and thus does not lend itself to any single therapy more than another. Trimethoprim is a moderate inhibitor of the CYP2C8 enzyme, which is important in the clearance of repaglinide. As such regular use of trimethoprim is a contraindication to the prescribing of repaglinide. There have been no studies indicating that repaglinide is preferable to other second-line agents in a younger cohort.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Repaglinide

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## Question 959:

A 65-year-old female with diabetic gastroparesis presents with persistent symptoms after various dietary modifications and symptomatic treatments with antiemetics and prokinetic agents. She has been on metoclopramide for a few years with mild symptom relief. She has been trying diet modifications as recommended. She also had multiple hospital admissions for dehydration and electrolyte abnormalities, during which she responded well to erythromycin but only short-term. She continues to have persistent symptoms contributing to a 20-pound (9 kg) weight loss. Which of the following recommendations should be considered in the management of gastroparesis?

## Choices:

1. Intrapyloric botulinum injections
2. Partial gastrectomy and pyloroplasty
3. Gastric electrical stimulation
4. Jejunostomy tube placement

## Answer: 3 - Gastric electrical stimulation

## Explanations:

- Refractory gastroparesis could pose complications of severe protein-calorie malnutrition and should be addressed appropriately to alleviate symptoms. As the patient has tried different medical management options, she should be considered for gastric electrical stimulation.
- Gastric electrical stimulation has shown to relieve symptoms, mainly frequency of vomiting, and further need for enteral nutrition through a jejunostomy tube. Gastric electric stimulation is FDA approved as a humanitarian use device.
- Gastric electrical stimulator implantation should be offered before proceeding to a permanent jejunostomy tube for enteral nutritional supplementation.
- Intrapyloric botulinum injections have not shown to be effective in randomized controlled studies. Also, partial gastrectomy and pyloroplasty surgical procedures are more invasive and less studied, only used in unusual specialized circumstances.

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## Research Concepts:

### Gastroparesis

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## Question 960:

A 17-year-old girl presents to the office for a consultation as she feels that her periods are not regular. They vary from 25 to 38 days and are associated with heavy and painful menses. The patient had her menarche three years ago, and she has been facing this problem since then. Her past medical history is insignificant. She smokes irregularly but has never had alcohol. The patient is sexually active and is also looking for a short term contraceptive method. Examination shows a soft, non-tender abdomen with no organomegaly. S1 and S2 are audible with no added sounds. Breath sounds are also clear bilaterally. Before starting the appropriate therapy for this patient, about what should she be counseled?

## Choices:

1. Decreased libido
2. Increased risk of blood clots
3. The increased overall risk of cancer
4. Weight gain

## Answer: 2 - Increased risk of blood clots

## Explanations:

- The optimal treatment for a patient with an irregular menstrual cycle who is looking for temporary contraception is combined oral contraceptive pills.
- Combined oral contraceptives contain both estrogen and progesterone and are therefore part of hormone replacement therapy (HRT).
- The known side effects of HRT are increased risk of breast cancer, myocardial infarction, stroke, and pulmonary embolism.
- It does not decrease libido, cause weight gain, or increase the overall risk of cancer.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hormone Replacement Therapy

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## Question 961:

A 51-year-old man presents to the hospital complaining of abdominal pain and distension for a few weeks. He further reports severe loss of libido and erectile dysfunction for the past six months. On examination, he appears to be tanned, and there is mild peripheral edema and increased abdominal circumference; however, the remainder of the examination is unremarkable. His past medical history is significant for NSAIDs use for the relief of arthralgias. His laboratory investigations reveal a gamma-glutamyl transferase of 55 U/L (normal range 9–48 U/L) and transferrin saturation of 95%; serology shows positive HBeAb. What is the most appropriate treatment for this patient?

## Choices:

1. Ursodeoxycholic acid
2. Phlebotomy
3. Desferrioxamine
4. Penicillamine

## Answer: 2 - Phlebotomy

## Explanations:

- The history, physical exam, and lab findings are suggestive of hemochromatosis. Cirrhosis is present in 70% of patients with hemochromatosis. In these patients, there is a marked increased incidence of hepatocellular carcinoma, which is a major cause of death.
- If the ferritin level is above 200 mcg/L in women or 300 mcg/L in men, or a transferrin saturation is more than 40% in women or 50% in men, it should lead to further testing.
- The conventional therapy for primary hemochromatosis is phlebotomy. By removing red blood cells, the major mobilizer of iron in the body, iron toxicity, can be minimized. Patients may require 50 to 100 phlebotomies of 500 mL each to reduce iron levels to normal. Phlebotomy is usually performed once or twice a week. Once iron levels have normalized, lifelong but less frequent, phlebotomy (typically 3-4 times a year) is required.
- The objective is to obtain a ferritin level of less than 50 mcg/L. Alcohol should be strictly prohibited in this condition because it can accelerate liver and pancreatic toxicity. Preexisting end-organ damage is rarely reversed by phlebotomy.

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## Research Concepts:

### Hemochromatosis

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## Question 962:

A 40-year-old African American female is brought in by her husband, complaining that she has been drinking a lot of water recently. She has been urinating numerous times in a day. For two days, she has become drowsy and not been herself as per her husband. She suffered a traumatic brain injury after falling from the back of a truck 4 months ago and has had some cognitive deficits since. She also has a history of sarcoidosis, diabetes mellitus, and hypertension. Her medications include hydrochlorothiazide, metformin, and hydroxychloroquine. She has not had a flare-up of sarcoidosis recently. Her blood pressure is 140/92 mmHg. Lab work is significant only for serum sodium 108 mEq/L. She is admitted for the management of hyponatremia. She is administered 3% hypertonic saline at 50 mL/h in the ICU. Serum sodium is 117 mEq/L 4 hours later. What is the next best step in the management of this patient?

## Choices:

1. Infuse sterile water through the intravenous line
2. Infuse dextrose 5% water
3. Continue hypertonic saline but at a decreased rate of 25 mL/h
4. Administer tolvaptan

## Answer: 2 - Infuse dextrose 5% water

## Explanations:

- The rapid rise in serum sodium in a chronic hyponatremic patient can cause central pontine myelinolysis. Central pontine myelinolysis is caused by dehydration of the brain tissue and separation of the myelin sheath from the axons due to higher osmolality in the serum when compared to the neuron sheaths.
- The correct answer here is to infuse D5 water, which is an isotonic solution to decrease serum sodium level since the serum sodium level in this patient has increased too quickly by 9 mEq/L in a span of four hours.
- D5 water has no sodium in it, thereby diluting and decreasing the sodium level in the blood. If the serum sodium is increasing too fast, it should be slowed down or reversed, to decrease the rate of correction. Sodium should not increase by more than 10-12 mEq/L in 24 hours.
- Central pontine myelinolysis results in neurological deficits like altered mental status, difficulty with the ability to speak and swallow, weakness of body parts, and decrease in sensation, etc. Infusion of sterile water can cause hemolysis due to the hypotonicity of the fluid. Decreasing hypertonic saline will still make the sodium level go up. Administering tolvaptan, which is a vasopressin antagonist, will also make the sodium level go up, which is not desired in this case.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Primary Polydipsia

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## Question 963:

A 43-year-old male with a past medical history of hypertension presents to the clinic for abdominal pain and diarrhea for the last several months. He describes a burning pain in the epigastric region which is partially relieved with over-the-counter omeprazole. He is now taking this medication daily with only mild relief. He is reporting unintentional weight loss and is found to be anemic with guaiac-positive stool on testing. He reports a family history of stomach cancer in multiple first and second-degree relatives. If present, which of the following is associated with a poor prognosis for this patient?

## Choices:

1. Hyperparathyroidism
2. Multiple duodenal tumors
3. Liver metastasis
4. Lymph node metastasis

## Answer: 3 - Liver metastasis

## Explanations:

- This patient likely has Zollinger Ellison syndrome (ZES) with multiple endocrine neoplasia type 1 (MEN1). Patients with MEN1 have decreased life expectancy due to malignant tumors or direct endocrine complications. Liver metastasis in these patients is associated with a life expectancy of less than 1 year with a 5-year survival rate of 20 to 30%.
- About 60 to 90% of gastrinomas are malignant with metastasis to the lymph nodes, liver, or distant organs at the time of diagnosis.
- Metastasis to the liver has a direct effect on overall survival as pancreatic gastrinomas have lower long-term survival rates than duodenal gastrinomas. Patients with liver metastases have a 15% 10-year survival rate after surgery, but those without liver metastases have a 95% 20-year survival rate.
- Duodenal gastrinomas have a higher incidence of lymph node metastases than pancreatic gastrinomas, 70% versus 40%, respectively. However, lymph node involvement did not show a decrease in survival without liver metastases.

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## Research Concepts:

### Zollinger Ellison Syndrome

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## Question 964:

A 35-year-old female patient presents to the clinic with complaints of irregular menstrual cycles and a thick yellowish fluid oozing out of her breasts. She is sexually active and has been married for four years but for no known reason, she is unable to get pregnant. The rest of the physical examination is unremarkable. The thyroid function tests are within a normal range, and serum prolactin level is 69 ng/ml (4.8 to 23.3 ng/ml). MRI shows a 2.0 cm pituitary mass. Which of the following drugs is used to treat this pathology?

## Choices:

1. Cabergoline
2. Synthetic thyroid hormone
3. Tricyclics and SSRI antidepressants
4. Oral contraceptives

## Answer: 1 - Cabergoline

## Explanations:

- Treatment of hyperprolactinemia depends on the cause. Once the physiological cause of hyperprolactinemia is excluded, one should look for other possible systemic causes and address them for the symptomatic patients.
- Treatment is only necessary if patients develop hypogonadism, osteoporosis, or troublesome galactorrhea. If hyperprolactinemia is suspected because of drugs, it should be discontinued temporarily, if possible, to see if prolactin level normalizes. If medication cannot be discontinued, especially antipsychotics, it should be changed to a different antipsychotic agent that does not increase prolactin, e.g., quetiapine. If that is not possible, the addition of dopamine agonists should be considered. These changes should be made in consultation with a psychiatrist. The addition of estradiol in women and testosterone in men can be considered for hypogonadism and low bone mass. If the prolactin level does not normalize after stopping medication or if discontinuation of medication is not possible, pituitary MRI should be done.
- Endocrine society guideline recommends against treatment with a dopamine agonist for asymptomatic microadenoma but recommends dopamine agonist therapy to decrease prolactin levels, tumor size, and normalize gonadal function for symptomatic patients with microadenomas or macroadenomas. Cabergoline is preferred to other dopamine agonists due to higher efficacy in normalizing prolactin levels and tumor shrinkage.
- Most of the prolactinomas are treated with medical therapy only. Surgery and radiotherapy are reserved for those who are resistant to medical therapy with the dopamine agonists. Endoscopic endonasal transsphenoidal surgery is a preferred surgical method. Prophylactic surgery is considered in women with large prolactinomas, which potentially threatens vision during pregnancy.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hyperprolactinemia

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## Question 965: A 16-year-old female presents with a history of recurrent pancreatitis. Upon physical exam, multiple xanthomas were found, and hepatomegaly was observed. Labs indicated elevated levels of triglycerides. What is the enzyme dysfunction in this disease?

## Choices:

1. Lipoprotein lipase
2. Trypsin
3. Lactase
4. Lactate dehydrogenase

## Answer: 1 - Lipoprotein lipase

## Explanations:

- Patients with hyperchylomicronemia present with recurrent pancreatitis, enlarged liver, and xanthomas because of lack of triglyceride removal from chylomicrons and consequent increased levels of serum triglycerides and increased chylomicrons.
- In both type one familial dyslipidemia or hyperchylomicronemia, there is severe LPL dysfunction; this is because of LPL deficiency and LPL co-factor deficiency, or apolipoprotein C2 deficiency, which is necessary for activation of lipoprotein lipase.
- LPL normally removes triglycerides from chylomicrons, and if this process does not function, initial triglyceride breakdown cannot take place.
- Therefore, triglycerides will build up in the serum and chylomicrons will grow very large as they are full of triglycerides, which are not undergoing removal.

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## Research Concepts:

### Biochemistry, Lipoprotein Lipase

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## Question 966:

A 40-year-old male presented in office with complaints of shortness of breath and dry cough for the past few months. He works in a library and does not smoke or drink alcohol. He has a history of major depression treated with psychotherapy. He had a stick, which "helps to prevent a fall as he walks downstairs." The patient denies any change in weight or appetite and appears to be healthy. His medical history is insignificant, and family history is not known as he was adopted. On examination, his breath sounds are normal. However, the patient coughed as he drank water from his water bottle. He had been keeping this bottle for one month as his tongue feels dry. The evaluation includes a CT chest, which demonstrates mass in the anterior mediastinum. Which of the following statements is true regarding this mass?

## Choices:

1. It is most often treated with local resection and radiation therapy
2. The most common paraneoplastic syndrome associated is Lambert-Eaton myasthenic syndrome
3. Adjunctive chemotherapy is recommended for low-grade tumors
4. It is more common in young males

## Answer: 1 - It is most often treated with local resection and radiation therapy

## Explanations:

- The patient presents with anterior mediastinal mass, muscle weakness and autonomic symptom of dry mouth. This points to the diagnosis of thymoma. Generally, a thymoma is slow-growing and can become locally invasive. Stage IA tumors can be treated with local resection alone while other thymomas are treated with surgical resection and radiation therapy.
- The most common paraneoplastic syndrome associated is myasthenia gravis, although Lambert-Eaton myasthenic syndrome can also occur as in this case. Other paraneoplastic syndromes include Addison disease, Cushing syndrome, pure red cell aplasia, and nephrotic syndrome.
- Chemotherapy with platinum-based drugs is used in recurrent thymomas.
- Thymomas are more common between 40 and 60 years of age, and there is a similar incidence in both the sexes.

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## Research Concepts:

### Anterior Mediastinal Mass

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## Question 967:

A 74-year-old woman with a history of hyperlipidemia, type 2 diabetes mellitus, and Alzheimer disease is brought to the clinic for a follow-up visit. The patient has no current complaints. She last saw her provider one year ago and was recommended a weight-loss regimen, including caloric restriction and daily exercise. Vital signs are stable. There has been a 25 lbs weight loss since the last visit. Which of the following factors is most likely to be decreased in this patient?

## Choices:

1. Platelet-derived growth factor (PDGF)
2. Transforming growth factor-beta (TGF-beta)
3. Vascular endothelial growth factor (VEGF)
4. Insulin-like growth factor 1 (IGF-1)

## Answer: 4 - Insulin-like growth factor 1 (IGF-1)

## Explanations:

- Caloric restriction notably decreases the amounts of growth factors such as IGF-1, anabolic hormones, and inflammatory cytokines in the bloodstream as well as oxidative stress markers that are linked to certain cancers.
- Reducing body weight by decreasing calorie intake and increasing activity level greatly reduces the health risks associated with obesity. In fact, it is known to extend lifespans and even prevent the decline of brain function as one ages. Together, exercise and a caloric reduction can decrease neurodegenerative disease as a whole.
- According to Alzheimer transgenic models, caloric restriction can prevent beta-amyloid deposition, which is the hallmark of Alzheimer disease. It also can reduce oxidative stress on the brain and support the plasticity of the synapses.
- Obesity leads to depression, anxiety, and low self-esteem. Obesity can also, unfortunately, lead to unfair disadvantages such as being bullied and having fewer friends, which creates a feedback loop into even more depression and low self-esteem. This is clinically relevant because an outlook of negativity or overall harmful mental health can take a great toll on one's physical health and vice versa. Thus, it is imperative for clinicians, especially primary care physicians, to strongly encourage and motivate their patients to take better care of themselves through healthier eating habits, choosing fewer calories with greater nutritional value, staying active, and aiming for healthy body weight for their height.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Calories

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## Question 968:

A 17-year-old female patient was referred to the bariatric surgery clinic, asking for a possible restrictive bariatric surgery. Her physical examination revealed significant central obesity and proximal muscular wasting in both upper and lower limbs. Several purple striae are evident around the abdomen. Patchy colorless scaly lesions at the extensor surface of both feet are significant. She denies any specific medication and substance taking. What is the preferred next management?

## Choices:

1. Obtaining low dose dexamethasone suppression test
2. Obtaining a high dose dexamethasone suppression test
3. Bounded cortisol in 24 hours collected urine
4. Abdominal CT scan

## Answer: 1 - Obtaining low dose dexamethasone suppression test

## Explanations:

- Cushing syndrome is mostly caused by abnormal corticosteroid intake. If an obvious history of glucocorticoid administration along with a variety of symptoms including visceral obesity, buffalo hump, moon face appearance, generalized abdominal and limb striae and decreased bone mineral density exists, obtaining extra diagnostic tests would be unnecessary. The skin lesions at the extensor surface might be the evidence of a partially healing lichen planus or psoriatic skin lesion for which the patient has taken oral corticosteroid and might deny that specific history.
- Few patients affected with adrenal cortical hyperplasia might present with clinical and laboratory evidence of increased level of aldosterone, including elevated blood pressure, decreased level of potassium, and disturbed arterial blood gas demonstrating metabolic alkalosis.
- When the impression is Cushing syndrome (CS) and the laboratory evidence of an increased level of cortisol has been established, the exclusion of exogenous hypercortisolism should be prioritized.
- The elevated level of cortisol is well documented utilizing several specific laboratory examinations including the measurement of unbounded cortisol in 24 hours collected urine, evaluating low dose dexamethasone suppression test, and assessment of nocturnal salivary cortisol. ACTH-independent Cushing syndrome, which is characterized by low level of ACTH, and elevated cortisol might demand an abdominal CT scan for diagnosis confirmation. High dose dexamethasone suppression test differentiates the Cushing disease and ectopic ACTH secretion.

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## Research Concepts:

### Adrenal Cortical Nodular Hyperplasia

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## Question 969: A 60-year-old male with a history of type 2 diabetes mellitus, hypertension, and back pain on metformin, metoprolol, and aspirin presents with episodic vomiting, nausea, and abdominal pain. He has lost 6 pounds (3 kg) and all bloodwork appears to be normal. Upper gastrointestinal barium studies are normal. What is the next best step?

## Choices:

1. Upper endoscopy
2. Surgery
3. Gastric emptying scintigraphy
4. H. pylori cultures

## Answer: 3 - Gastric emptying scintigraphy

## Explanations:

- Gastroparesis is a complication of diabetes that causes early satiety, recurrent nausea and vomiting, and weight loss.
- Gastric emptying scintigraphy would show delayed gastric emptying in a patient with gastroparesis.
- A barium swallow study looks at esophageal motility, but the patient does not complain of dysphagia.
- The first-line treatment for gastroparesis is metoclopramide.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Diabetic Gastroparesis

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## Question 970:

A 30-year-old man presents because he and his partner have not been able to conceive a child in the last two years despite concerted efforts. He has no past medical history. He eats a high-protein diet and exercises daily in order to be muscular. He weighs 90 kg and is 5 feet 9 inches tall. His vital signs are oxygen saturation 98% on room air, respiratory rate 14 per minute, heart rate 65 bpm, blood pressure 132/82 mmHg, and temperature 37 C (98.6 F). On examination, there are small testes and facial acne. Given the likely diagnosis, which of the following laboratory findings would be expected?

## Choices:

1. Decreased testosterone; decreased luteinizing hormone (LH)
2. Normal testosterone; decreased LH
3. Decreased testosterone; normal LH
4. Decreased testosterone; increased LH

## Answer: 2 - Normal testosterone; decreased LH

## Explanations:

- Many bodybuilders and athletes use anabolic steroids to increase performance and muscle mass.
- Exogenous androgens inhibit gonadotropin-releasing hormone (GnRH) release by the hypothalamus via feedback inhibition, which causes decreased LH and follicle-stimulating hormone (FSH) release by the pituitary gland and decreased testosterone production by the testes.
- Endogenous testosterone production is low but exogenous androgen is detected; therefore, the patient has normal serum testosterone levels on the current assay.
- This leads to decreased testicular size and infertility. Other adverse effects include aggressiveness, acne, and gynecomastia.

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## Research Concepts:

### Anabolic Steroid Use Disorder

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## Question 971:

A 17-year-old female with a past medical history of anxiety presents to the hospital with complaints of increased thirst and urination. She states that her life has been disrupted by this habit. Her lab work is significant for a sodium level of 137 mmol/l and a urine osmolality of 400 mOsm/l. She is given a prescription for clonazepam and discharged after being counseled to decrease water intake. She presents again to the clinic after one month with the same complaint and worsening severity. Lab work reveals a sodium level of 136 mmol/l and urine osmolality of 374 mOsm/l. The decision is made to admit her to the hospital. Overnight she is found to have consumed 6 liters of water. She is told that she will undergo a water deprivation test. She vehemently refuses to undergo this test. What is the next step in the diagnosis?

## Choices:

1. 3% saline infusion
2. Arginine infusion
3. Obtain an arginine vasopressin level
4. Obtain a copeptin level

## Answer: 4 - Obtain a copeptin level

## Explanations:

- Copeptin is a c-terminal peptide of the vasopressin precursor, which is a stable peptide, measurable, and stable ex-vivo, unlike vasopressin (AVP) also called anti-diuretic hormone (ADH). Copeptin correlates well with vasopressin levels and is measured by a sandwich assay.
- If the copeptin level is greater than 21.4 pmol/l, it is diagnostic of nephrogenic diabetes insidious. If the level of copeptin is less than 21.4 pmol/l, the next step would be to proceed with stimulating vasopressin secretion, thereby stimulating copeptin secretion as well with hypertonic saline in this case as she refuses water deprivation test.
- Based on the level of copeptin post-stimulation, it is possible to differentiate between primary polydipsia and central diabetes insipidus. If the copeptin level is more than 4.9 pmol/l, it is diagnostic of primary polydipsia, less than 4.9 pmol/l. It is diagnostic of central diabetes insidious.
- 3% hypertonic saline infusion can be done after checking the copeptin level, not before. Arginine infusion to stimulate vasopressin secretion, thereby measuring copeptin, has been done only in a single study and needs more evidence before being adopted. Arginine vasopressin (AVP) can be directly measured but is non-reliable given its not stable ex vivo.

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## Research Concepts:

### Primary Polydipsia

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## Question 972:

A 31-year-old man presents to the clinic for follow up. He has a history of acromegaly, for which he takes octreotide. He is currently complaining of skin rash and flushing of the face. An octreotide scan is planned. Which of the following is the next best step in the management of this patient?

## Choices:

1. Perform the scan now
2. Skip octreotide on the day of the scan
3. Stop octreotide for one week before the scan
4. Stop octreotide for 4-5 months before the scan

## Answer: 4 - Stop octreotide for 4-5 months before the scan

## Explanations:

- Patients on octreotide therapy or somatostatin must stop treatment.
- Long-acting octreotide should be stopped 4-6 months before the scan.
- These medications may have an effect on the test results.
- Taking octreotide is not a contraindication for the scan.

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## Research Concepts:

### Octreotide Scan

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## Question 973: A 65-year-old male has an enlarged skull with frontal bossing. The temporal arteries are dilated and bruits are audible over the bone. What is the most likely diagnosis?

## Choices:

1. Temporal arteritis
2. Occult hydrocephalus
3. An arteriovenous malformation
4. Paget disease

## Answer: 4 - Paget disease

## Explanations:

- The general appearance of the head may be virtually pathognomonic for Paget disease; characteristic findings include enlargement of the head with frontal bossing, dilated temporal arteries, and bruits audible over the bone.
- The pathogenesis of Paget disease involves four stages. The first stage is osteoclastic activity, the second is a mixed osteoclastic-osteoblastic activity, the third is osteoblastic activity, and the fourth is malignant degeneration.
- The first clinical manifestation is most often an elevated serum alkaline phosphatase.
- Calcium, phosphate, and aminotransferase are most often normal in patients with Paget disease.

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## Research Concepts:

### Paget Disease

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## Question 974:

An 11-year-old boy is brought to the clinic with complaints of excessive hunger and irritability. The mother reports that his appetite is much more than his father's and that she needs to give him two portions of adult quantity food, and he still feels hungry 20 minutes later. She consulted the school nutritionist, who guided her on frequent yet small portions of food. The child still feels hungry. On examination, the boy weighs 50 kg with a height of 145.2 cm with central obesity and early striae with acanthosis nigricans. A mutation in which of the following genes is most likely to be present in this individual?

## Choices:

1. MC4R
2. LEPR
3. PPARG
4. TP53

## Answer: 1 - MC4R

## Explanations:

- The patient gives a classical history of childhood hyperphagia with features of metabolic syndrome signifying childhood-onset obesity. The most commonly mutated gene for obesity is MC4R.
- GWAS has established that the rs17782313 near MC4R is strongly associated with obesity.
- rs17782313 T allele mutation can cause promoter hypermethylation and decreased expression of MC4R. MeQTL and eQTL analysis can be applied to explore the effect of rs17782313 MC4R expression and its link to childhood or pediatric obesity.
- LEPR and PPARG are other common genes associated with obesity. TP53 is the most common mutated gene for cancers.

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## Research Concepts:

### Genetics and Obesity

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## Question 975:

A 55-year-old man with a history of type II diabetes mellitus, hypertension, and end-stage renal disease presents with newly-diagnosed hypercalcemia. He has no history of kidney stones or arrhythmia, but on further workup was found to have a PTH = 1,600 pg/mL. His primary physician ordered a sestaMIBI scan demonstrating increased activity in the right inferior thyroid bed. Pertinent vital signs include blood pressure of 157/100 mm Hg, heart rate of 69 beats/min. On physical examination, his oral exam is normal, and his neck exam reveals no lymphadenopathy. His thyroid exam reveals a palpable, firm, 1.5cm mass of the inferior thyroid that elevates with swallowing. His lung exam reveals bilateral rales at the bases. His mother has a history of thyroid cancer, but he does not know the type, though notes she is still alive and is in her late 90s. What is the next best step in his management?

## Choices:

1. Urine calcium levels and urinalysis
2. Computed tomography with IV contrast of the neck
3. Ultrasound of the neck
4. Repeat serum PTH, serum albumin level, ionized calcium level corrected for albumin

## Answer: 2 - Computed tomography with IV contrast of the neck

## Explanations:

- The presence of extreme hyperparathyroidism with a palpable neck mass raises suspicion of malignancy.
- CT allows for further delineation of the mass and surrounding structures, as well as evaluation of the rest of the neck.
- Regional metastasis from parathyroid carcinoma is rare. Although distant metastasis is also rare, They may occur to the lungs, bone, mediastinal nodes, liver, and kidney.
- Extremely high PTH level is a hallmark of carcinoma and is unlikely to be due to calculation errors due to hypoalbuminemia.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Parathyroid Cancer

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## Question 976:

A 45-year-old woman with no significant medical history presents for a general checkup. She reports that both her mother and father died in their 40s from heart disease, and neither of them had any traditional cardiac risk factors. A previous doctor had prescribed her rosuvastatin 20 mg daily for primary prevention. The patient's hemoglobin A1c is normal, and lipid panel is obtained and is significant for an LDL of 157 mg/dL. The decision is made to obtain Lp(a) levels given the family history and modestly elevated LDL. If the Lp(a) level is elevated, what is the most appropriate Lp(a) target range for this patient?

## Choices:

1. 5 mg/dL
2. 50 mg/dL
3. 30 mg/dL
4. 20 mg/dL

## Answer: 2 - 50 mg/dL

## Explanations:

- The general consensus is that Lp(a) levels >50 mg/dL are considered high risk and warrant treatment.
- The target range for treatment should be aimed to lower it to 50 mg/dL. It is unclear if levels will eventually return to the prior baseline.
- >14 mg/dL but 50 mg/dL is generally an intermediate risk category that ranges from borderline risk to moderate risk.
- Current data does not support initiating direct treatment therapy aimed at lowering Lp(a) if levels are 50 mg/dL.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Lipoprotein A

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## Question 977: A 36-year-old woman has been on a weight-loss journey, losing 12 pounds (5.5 Kg) over the past seven weeks. She is frustrated and looking for advice to continue losing weight. She has lost 11 pounds (5 Kg) in the first four weeks and has only lost 1 pound (0.5 Kg) over the past three weeks. This phenomenon can best be explained by which of the following?

## Choices:

1. Elevated non-exercise activity thermogenesis
2. Decreased non-exercise activity thermogenesis
3. Elevated basal metabolic rate
4. Decreased basal metabolic rate

## Answer: 4 - Decreased basal metabolic rate

## Explanations:

- Weight loss results in a loss of metabolically active tissue.
- A decrease in metabolic activity results in a decrease in basal metabolic rate as a whole, decreasing energy expenditure.
- Overall in weight loss, the total daily energy expenditure (TDEE) is decreased as the body tries to compensate and decrease energy utilization as energy intake decreases.
- Increase NEAT can be a means of increasing the total energy expenditure, thus continuing a calorie deficit and progressing in weight loss through a plateau period.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Management Of Weight Loss Plateau

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## Question 978:

A 14-year-old boy with a history of cystic fibrosis is brought to the clinic for a routine visit. He reports that he is at his baseline health and denies any polyuria or polydipsia. As part of diabetes screening, laboratory workup shows hemoglobin A1c level 6.1%, and a 2-hour 75 g oral glucose tolerance test plasma glucose level is 220 mg/dL. Which of the following is the most common presentation of this disease in this patient population?

## Choices:

1. Polyuria and polydipsia
2. Weight loss and low body mass index (BMI)
3. Asymptomatic; diagnosed by screening
4. Diabetic ketaoacidosis

## Answer: 3 - Asymptomatic; diagnosed by screening

## Explanations:

- The majority of patients with CFRD will not present with the typical symptoms of diabetes (polyuria and polydipsia).
- Patients with CF should be screened routinely for the development of diabetes.
- Screening CF patients with a glucose tolerance test is essential to make the diagnosis of CFRD.
- Diabetic ketoacidosis is an unusual presentation of CFRD patients.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Cystic Fibrosis Related Diabetes

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## Question 979:

A 37-year-old woman with a past medical history of migraines and polycystic ovarian syndrome is evaluated for a change in her usual headaches. The headaches are occurring more frequently and respond poorly to her previously effective medications. She is otherwise healthy and exercises three times per week. She wears contact lenses. She discontinued oral contraceptive pills eight years ago due to intolerance. She currently only uses ibuprofen and sumatriptan. On physical examination, her vital signs are normal. Her body mass index is 26 kg/mm2. The rest of her physical examination, including funduscopic examination, is normal. An initial CT brain was nondiagnostic. MRI with gadolinium reveals a 0.7 cm pituitary adenoma with a suprasellar extension but no compression or encroachment of the optic chiasm or optic nerves. There are no other abnormalities. Her chemistry panel is within normal limits. A urine pregnancy test is negative. Laboratory studies show: cortisol (8am) - 17 mcg/dL (normal: 5 - 25 mcg/dL), thyroid-stimulating hormone (TSH) - 3.6 mcU/mL (Normal: 0.5 - 5.0 mcU/mL), and thyroxine (T4) - 1.5 ng/dL (Normal: 0.9 - 2.4 ng/dL). Which of the following would be the best next course of action?

## Choices:

1. Visual field testing
2. Referral to neurosurgery
3. Measurements of prolactin and insulin-like growth factor 1 (IGF-1)
4. Abdominal CT scan to check for pancreatic masses

## Answer: 3 - Measurements of prolactin and insulin-like growth factor 1 (IGF-1)

## Explanations:

- The establishment of a microadenoma versus a macroadenoma occurs with the size seen on an MRI, and the workup is dictated by this classification. All microadenomas require the complete pituitary hormonal panel to rule out hypersecretory tumors and must include insulin-like growth factor 1 (IGF-1) (for growth hormone) and prolactin levels.
- On imaging or gross pathology, they can be classified according to their size as macroadenomas when greater than 1 centimeter or microadenoma when less than 1 centimeter.
- Early morning cortisol levels are reserved for patients with symptomatic manifestations of Cushing's syndrome.
- Referral to a surgeon for transsphenoidal resection is required when adenomas are refractory to medical therapy, are specific secretory tumors, or cause visual field defects. Visual field testing is indicated in all tumors that are large in size, macroadenomas, or are abutting the optic chiasm or nerves on imaging. This microadenoma that the patient has no signs of abutting the optic chiasm. The patient also does not have any changes in her vision. Repeating an MRI and labs at 6 months is a reasonable option once a functioning pituitary tumor has been ruled out.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Pituitary Cancer

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## Question 980:

A 16-year-old girl presents with a history of progressive visual disturbance and primary amenorrhea. Over the last 2 years, she has been having slowly progressive problems with her vision. On visual examination, it is revealed that she has bitemporal hemianopia. She is in the 99th percentile for both height and weight and has been having lower back pain. The examination of her spine reveals kyphosis. Which of the following would most likely be elevated in this patient?

## Choices:

1. Androgens
2. Insulin
3. Growth hormone (GH)
4. ACTH

## Answer: 3 - Growth hormone (GH)

## Explanations:

- This patient most likely has a growth hormone-secreting tumor of the pituitary gland. This would cause an elevation of serum growth hormone as well as insulin-like growth factor 1 which is released from the liver in response to GH stimulation.
- Pituitary adenomas can compress the optic nerve at the optic chiasma causing bitemporal hemianopia. They can also be hormone-secreting which is diagnosed on the basis of clinical findings and lab tests.
- This patient's height and weight in the 99th percentile along with bitemporal hemianopsia points towards the possibility of a GH secreting tumor causing gigantism.
- Excessive androgens would virilization. Excess ACTH would cause cushing syndrome. Excess insulin secretion would cause signs of hypoglycemia.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Gigantism And Acromegaly

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## Question 981:

A 16-year-old boy is brought to the hospital with a 6-hour history of abdominal pain associated with nausea and vomiting. He has a history of type I diabetes with poorly controlled blood sugars and many past admissions with DKA. On examination, there is generalized abdominal tenderness and hepatomegaly. There are no signs of peritonism. Initial lab tests show blood glucose 510 mg/dL (65-110 mg/dL), sodium 137 mEq/L (135-145 mEq/L), potassium 4.0 mEq/L (3.5-5 mEq/L), bicarbonate 18 mEq/L (18-22 mEq/L), chloride 98 mEq/L (95-105 mEq/L), ALT 260 U/L (16-63 U/L), AST 210 U/L (0-37 U/L), ALP 139 U/L (322 U/L), GGT 122 U/L (15-85 U/L), and HbA1c 13.2% (6.5%). A toxicology screen is negative, and acute hepatitis and autoimmune hepatitis panels are also negative. Copper studies are normal. An ultrasound of the abdomen shows an enlarged liver with a bipolar length of 25 cm, with normal echogenicity. No stones or biliary dilation are seen, and the gall bladder is of normal thickness. The spleen and kidneys also appear normal. Which of the following is most likely to explain the patient's clinical condition?

## Choices:

1. Diabetic ketoacidosis
2. Shock liver
3. The wide fluctuation of insulin and glucose levels
4. Non-alcoholic fatty liver disease (NAFLD)

## Answer: 3 - The wide fluctuation of insulin and glucose levels

## Explanations:

- Glycogenic hepatopathy remains underdiagnosed and underreported abnormality of the liver in patients with poorly controlled diabetes. The underlying pathophysiology thought to be is the wide fluctuation of insulin and glucose levels.
- Excess of glycogen accumulates in the liver in poorly controlled diabetes patients, causing hepatomegaly and elevated transaminases.
- A liver biopsy is needed to confirm the diagnosis of glycogenic hepatopathy. The biopsy of the liver shows enlarged hepatocytes due to the accumulation of glycogen in the cytoplasm.
- With good glycemic control, both clinical and biochemical features of glycogenic hepatopathy resolve within days to weeks occur. Improved glycemic control is the key to the management of glycogenic hepatopathy.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Glycogenic Hepatopathy

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## Question 982:

A 38-year-old female with a known history of Hashimoto thyroiditis presents to the office for evaluation. She is currently on levothyroxine 100 mcg daily, and she is compliant with taking her medicine. She recently found out that she is six weeks pregnant. Her vital signs show pulse rate 67 beats/minute and blood pressure 132/80 mmHg. Her physical examination is normal, with normal thyroid gland palpable. Her last thyroid-stimulating hormone test was done six months ago, which was at 3.8 mIU/mL (normal 0.45 - 4.5 mIU/ ml). Besides ordering thyroid function tests, which is the most appropriate action at this time?

## Choices:

1. No further action is needed at this time
2. Increase the dose of levothyroxine to 125 mcg daily
3. Continue levothyroxine 100 mcg daily and order a thyroid ultrasound
4. Start liothyronine along with levothyroxine

## Answer: 2 - Increase the dose of levothyroxine to 125 mcg daily

## Explanations:

- Most women with pre-existing hypothyroidism before pregnancy have an increased demand for thyroid hormone requirements during pregnancy.
- Thyroid hormone requirements increase with the progression of pregnancy by approximately 30%. Therefore, the correct answer is to increase the dose of Levothyroxine to 125 mcg daily.
- Routine thyroid ultrasound during pregnancy is not indicated.
- The thyroid function tests should be checked every 4 to 6 weeks until week 20 of pregnancy and at least once around the 30th week of gestation.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Thyroid Disease And Pregnancy

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## Question 983:

A 6-hour-old infant presents with sudden onset deviation of the eyes towards the right side and tachypnea. On physical examination, small nares and ears are noted, the patient looks cyanotic in the lower extremities, saturation is 94% in upper extremities, and 75% in lower extremities. A 2/6 pan-systolic murmur is heard in the left lower sternal border. The electrocardiogram has findings of right ventricular predominance. The blood gas done reveals metabolic acidosis. The chest radiograph shows cardiomegaly and increased pulmonary markings. An echocardiogram is done and reveals a right ventricular predominance. What is the most common syndrome associated with this congenital heart anomaly?

## Choices:

1. Down syndrome
2. DiGeorge syndrome
3. Turner syndrome
4. Klinefelter syndrome

## Answer: 2 - DiGeorge syndrome

## Explanations:

- Interrupted aortic arch often occurs in the presence of other systemic disorders, including the CHARGE syndrome.
- Almost 50% of patients with interrupted aortic arch (IAA) have a 22q11.2 deletion; this cause of 22q11.2 deletion syndrome, also known as DiGeorge syndrome.
- Hypocalcemia in an infant with a heart disorder is likely DiGeorge syndrome.
- Often these infants have absent parathyroid glands. This will lead to hypocalcemia, causing neonatal seizures.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Interrupted Aortic Arch

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## Question 984:

A 65-year-old woman comes to the clinic for a routine evaluation. She has a history of type 2 diabetes mellitus and multiple urinary tract infections. She is currently taken metformin and has been taking oral estrogen for five years for urogenital atrophy and vasomotor symptoms. Her HbA1c is 5.6%, and she reports eating a well-balanced diet, including plenty of fruits and vegetables. Which of the following could be the most likely complication if this patient takes estrogen in excess?

## Choices:

1. Hyperglycemia
2. Hypotension
3. Diabetic ketoacidosis
4. Altered mental status

## Answer: 4 - Altered mental status

## Explanations:

- Oral estrogen therapy is dose-dependent, therefore taking it in excess could potentially cause serious adverse effects, including vaginal bleeding and altered mental status.
- Altered mental status is a known complication of taking excess estrogen. Although a potential symptom of altered mental status is hypotension, taking excessive estrogen would not cause hypotension alone. Hypotension is not an associated complication for patients taking higher doses of estrogen; it correlates with fluid retention in patients receiving higher doses.
- Altered mental status is a potential complication when estrogen is taken in excess, in addition to vaginal bleeding, which can potentially cause or even worsen the altered mental status.
- Higher doses of estrogen are not particularly associated with hyperglycemia, and her diabetes is under control with diet and metformin. Diabetic ketoacidosis is a complication of type 1 diabetes and is not associated with estrogen therapy.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Estrogen Therapy

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## Question 985:

A young patient presents to the clinic with a painful tethered lump inside his mouth. Palpation causes an electric shock type of pain. Upon further questioning, there is no trauma associated with this lump, but there are multiple similar-looking lesions all over his face, although none this painful. The patient also appears to be unusually tall. What other conditions are most likely to be seen in this patient?

## Choices:

1. Medullary thyroid cancer, pheochromocytoma
2. Medullary thyroid cancer, insulinoma
3. Pheochromocytoma, glucagonoma
4. Papillary thyroid cancer, insulinoma

## Answer: 1 - Medullary thyroid cancer, pheochromocytoma

## Explanations:

- The patient has MEN2B syndrome. This consists of marfanoid habitus, mucosal neuromas, phaeochromocytoma, medullary thyroid cancer.
- MEN2B usually presents in the first decade of life, usually start with mucosal neuromas.
- Although the neuromas, the marfanoid habitus, and the thyroid cancer almost always present, phaeochromocytoma can only be seen in 50% of cases.
- Other symptoms include constipation, dry eyes or lack of tears, low muscle mass, myopathy, delayed puberty.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Neuroma

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## Question 986:

A 65-year-old female is brought to the clinic by her husband with multiple complaints. She had mild depression, abdominal pain, excessive sleepiness, proximal muscle weakness, flank pain, and a general slowing of movements. The patient adds that she has had multiple episodes of renal calculi. She was diagnosed with pseudogout two months ago. On physical examination, there is obvious atrophy of her proximal limb musculature. The complete blood count is normal, but her chemistry panel shows calcium of 14.1 mg/dL and creatinine of 2.4 mg/dL. Given the most likely underlying cause of her symptoms, which of the following is the treatment of choice for this patient?

## Choices:

1. Bisphosphonates
2. Cinacalcet
3. Calcitonin
4. Surgery

## Answer: 4 - Surgery

## Explanations:

- This patient has signs and symptoms along with laboratory findings suggestive of primary hyperparathyroidism. When hyperparathyroid patients make stones, they tend to be calcium phosphate rather than the more common calcium oxalate. Any patient with calcium phosphate kidney stones should be suspected of possible hyperparathyroidism which can be effectively screened initially by checking a serum calcium level.
- Primary hyperparathyroidism can be remembered by "bones, stones, moans, and groans." There is an increased risk of pseudogout, calcium pyrophosphate deposition disease, in patients with primary hyperparathyroidism.
- Surgery remains the definitive treatment for primary hyperparathyroidism. Surgery is also the treatment of choice for hyperparathyroid patients with recurrent nephrolithiasis. Calcitonin, cinacalcet, hormone replacement therapy, and bisphosphonates can all be used in the medical treatment of hyperparathyroidism, but surgery is preferred especially in cases like this where the serum calcium is markedly elevated and there is recurrent nephrolithiasis.
- The current guidelines state that surgery should be recommended for asymptomatic primary hyperparathyroidism when: serum calcium is more than 1 mg/dL greater than the upper limit of normal, age younger than 50 years, osteoporosis, GFR less than 60 mL/min, urine calcium greater than 400 mg/24 hours, evidence of renal calcification or stones.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Primary Hyperparathyroidism

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## Question 987: A male patient with obesity presents to you with complaints of increased appetite, weight gain, and polyuria. He has to wake up at least two times every night to pass urine. Last week his urinary glucose was positive with the dipstick, and it is decided to perform a fasting plasma glucose level to confirm the diagnosis. It is 127 mg/dl. Considering the diagnosis, which of the following drugs is most commonly used for treatment?

## Choices:

1. Metformin
2. Sulfonylureas and metformin
3. Sitagliptin and sulfonylureas
4. Insulin

## Answer: 1 - Metformin

## Explanations:

- There are many criteria to make a diagnosis of diabetes. The fasting blood glucose test is sometimes used.
- After fasting for 8 hours, if the fasting blood glucose is greater or equal to 126 mg/dl, one should suspect a diabetic state. The test should always be repeated.
- Hemoglobin A1c measurements can be obtained to confirm the diagnosis of diabetes. Testing with A1c identifies 20% fewer cases than those diagnosed based on fasting glucose levels. Hemoglobin A1c testing cannot be used reliably in patients with abnormal red cell turnover like in hemolytic anemia.
- Approximately 70% of people with prediabetes will go on to be diagnosed with diabetes mellitus. However, this is not inevitable. Prediabetes managed appropriately can prevent diabetes mellitus and lower the risk of cardiovascular disease. Some patients will need to take some medications. These patients include those who have failed to maintain adequate lifestyle therapy or are at high risk of developing type 2 diabetes. The most common medication used for early diabetes is metformin.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Prediabetes

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## Question 988:

A 40-year-old man was brought to the emergency department (ED) with altered mental status and gait disturbance. A review of past medical records indicated that he underwent sleeve gastrectomy six months ago. His medical co-morbidities included obesity (pre-surgical body mass index (BMI) was 62 kg/m^2, systemic hypertension, non-alcoholic steatohepatitis, and obstructive sleep apnea. After surgery, he was not compliant with follow up visits. He also developed intermittent vomiting, which progressively worsened over time. In the ED, his BMI was 45 kg/m^2. His vital signs included a temperature of 98.5 degrees Fahrenheit (36.9 C), pulse rate of 85 beats/minute, respiratory rate of 14/min, and blood pressure of 120/82 mmHg. He was not oriented to place, person, and time. He was irritable but responded minimally to verbal commands. He maintained his airway, and breathing was not labored. Normal heart sounds were heard. The chest was clear to auscultation with no added sounds. Pupils were normal in size and reactive. He had nystagmus on examination. He could move all four extremities and had a wide-based ataxic gait. The rest of the neurological examination could not be completed due to the patient's lack of cooperation. Bedside glucose estimation by digital glucometer revealed 130 mg/dL. An intravenous line was placed. Which among the following is the next immediate course of action?

## Choices:

1. Intravenous administration of thiamine
2. Estimation of plasma thiamine and wait for the results before correction with thiamine
3. Intramuscular administration of vitamin B12
4. Estimation of serum methylmalonic acid (MMA) and administration of vitamin B12, if MMA is abnormally high

## Answer: 1 - Intravenous administration of thiamine

## Explanations:

- This patient with post-sleeve gastrectomy status presented with the classic triad of Wernicke's encephalopathy due to thiamine deficiency. The triad includes encephalopathy, oculomotor findings (such as nystagmus, ophthalmoplegia), and signs of cerebellar impairment (such as ataxic gait and dysmetria). Patients can also have polyneuropathy. If psychosis and confabulation present, it is referred to as Wernicke-Korsakoff syndrome. The most common manifestation of Wernicke's encephalopathy is altered mental status.
- After sleeve gastrectomy, patients are prone to many vitamin and mineral deficiencies. Clinicians should screen patients for these deficiencies pre and post-surgery, and patients also should take the prescribed vitamin and mineral supplements regularly after sleeve gastrectomy.
- Non-compliance with vitamin supplements, prolonged emesis, rapid weight loss, and chronic alcoholism may predispose patients to develop thiamine deficiency.
- Clinicians should have a high index of suspicion for thiamine deficiency in patients who underwent weight-loss surgeries, including sleeve gastrectomy. They should proceed with immediate treatment before the laboratory confirmation of thiamine deficiency. After the thiamine administration, patients should be monitored and evaluated vigilantly for the improvement of clinical manifestations.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Sleeve Gastrectomy

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## Question 989:

A 38-year-old construction worker presents to the clinic for a followup of hypertension. He was diagnosed with high blood pressure two years ago and had been stable on hydrochlorothiazide until four months ago. During the past four months, blood pressure readings have remained high despite the addition of lisinopril and amlodipine to his regimen. He also complains of intermittent episodes of anxiety and palpitations, which last around 10 to 15 minutes each. He denies any flushing, chest pain, or tremors. He does not smoke or use drugs. Currently, he is afebrile and hemodynamically stable. A 24-hour ambulatory blood pressure monitoring is initiated, which reveals wide blood pressure variations. Lab values include sodium levels of 143 mEq/L, potassium level of 4.5 mEq/L, blood urea nitrogen 13 mg/dl, creatinine level of 0.8 mg/dl, and a fasting blood glucose levels of 131 mg/dl. What investigation is most likely to reveal the reason behind such discrepancies in blood pressure levels in this patient?

## Choices:

1. 24-hour urine free cortisol levels
2. 24-hour urine fractionated metanephrine levels
3. CT scan of the abdomen
4. Renal doppler ultrasound

## Answer: 2 - 24-hour urine fractionated metanephrine levels

## Explanations:

- A person having hyperglycemia, symptoms of episodic anxiety and palpitations with labile blood pressures despite being on multiple antihypertensive drugs warrants screening test for pheochromocytoma.
- 24-hour urine for catecholamines and metanephrines shows 87.5 percent sensitivity and 99.7 percent specificity.
- Imaging should only be done after laboratory abnormalities are determined.
- Renal doppler ultrasound is used for assessment of renovascular hypertension but the diagnosis will not explain hyperglycemia and episodic events of anxiety and palpitations in this patient.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Chromaffin Cell Cancer

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## Question 990:

A 39-year-old woman with a history of autism spectrum disorder and seasonal asthma presents to the clinic for follow-up. She takes an albuterol inhaler as needed and risperidone 6 mg daily since she was 15 years old to control her agitation, aggression, irritability, and sleep problems. She complains of extreme tiredness, fatigue, back pain with nonspecific diffuse body ache. She has a BMI of 35 kg/$m^2$. Her physical examination is unremarkable. An initial set of investigations is shown below.

| | Patient value | Reference range |
|---|---|---|
| Alkaline phosphatase | 178 IU/L | 44-147 IU/L |
| TSH | 4.5 microU/mL | 0.35-5.5 microU/mL |
| Prolactin | 400 ng/mL | 14 ng/mL |
| FSH | 8 mIU/mL | 4-25 mIU/mL |
| LH | 15 mIU/mL | 24-105 mIU/mL |

A chest x-ray is unremarkable, and a urine pregnancy test is negative. The hip DEXA scan is below 2.6 SD. Which of the following is the most likely cause of the patient's abnormal bone mineral density?

## Choices:

1. Risperidone
2. Autism spectrum disorder
3. Polycystic ovarian syndrome
4. Hypothyroidism

## Answer: 1 - Risperidone

## Explanations:

- Chronic exposure to antipsychotics, like risperidone, cause hyperprolactinemia. Untreated chronic hyperprolactinemia negatively inhibits gonadotrophin hormone leading to impaired mineral density.
- DEXA scanning is still the primary tool for assessing bone density. It has low radiation exposure, precise results, and lower cost.
- Thyrotoxicosis or hypothyroidism can cause hyperprolactinemia and subsequently impaired bone mineral density, and it is excluded with normal TSH level.
- Polycystic ovarian syndrome is not one of the differential diagnoses of impaired bone mineral density and can be excluded by FSH/LH level or ratio.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Atypical Antipsychotic Effect On Bone Mineral Density

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## Question 991:

A 65-year-old male with a history of persistent atrial fibrillation and hypertension that is treated with amiodarone and metoprolol presents with fatigue, weight gain, and constipation. His lab tests show serum sodium level of 145 mmol/L (136-145 mmol/l), potassium of 4.0 mmol/L (3.4-5.1 mmol/L), chloride of 100 mmol/L (98-107 mmol/l), bicarbonate of 24 mmol/L (22-29 mmol/l), blood urea nitrogen of 25 mg/dl (6-20 mg/dl), creatinine of 0.9 mg/dl (0.5-0.9 mg/dl), thyroid-stimulating hormone (TSH) of 7 mcU/ml (0.270 - 4.200 mc[IU]/mL), and free T4 of 0.5 ng/dl (0.93 - 1.70 ng/dL). Which of the following is the most appropriate next step?

## Choices:

1. Decrease the dose of amiodarone
2. Stop the amiodarone
3. Start levothyroxine replacement
4. Obtain thyroid ultrasound

## Answer: 3 - Start levothyroxine replacement

## Explanations:

- Amiodarone is an antiarrhythmic drug that can cause both hyperthyroidism and hypothyroidism.
- Thyroid function tests should be checked at the beginning and several weeks after amiodarone therapy.
- Patients with a history of positive anti-thyroid antibodies are at more risk of developing overt hypothyroidism on amiodarone therapy.
- For individuals like the patient in the scenario, who need to be on amiodarone and develops thyroid dysfunction, it is appropriate to continue amiodarone and treat the thyroid dysfunction simultaneously. Hypothyroidism is treated with levothyroxine and hyperthyroidism with steroids and antithyroid drugs. It is also important to remember that half-life of amiodarone is 100 days, and stopping amiodarone will not have any immediate effect on the thyroid dysfunction.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Thyroiditis

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## Question 992:

A 44-year-old male truck driver presents for a routine examination to renew his commercial driver's license. Upon review of systems, the patient admits to a 6-month history of decreased libido, loss of body hair, and gynecomastia. His blood pressure is 134/88 mmHg, pulse 78/min, respirations 16/min, and temperature 98.0 F (36.7 C). On physical examination, decreased axillary and pubic hair is observed. Gynecomastia is present. Imagining is likely to confirm the diagnosis with an abnormality in which of the following locations?

## Choices:

1. Sella turcica
2. Cerebellar vermis
3. Posterior fossa
4. Pons

## Answer: 1 - Sella turcica

## Explanations:

- Prolactin-secreting tumors of the pituitary gland are called prolactinomas. It is the most common secretory tumor of the pituitary gland accounting for a large proportion of total pituitary adenomas. Prolactinomas cause a variety of symptoms either due to the mass effect of the tumor or due to hypersecretion of prolactin.
- Visual field defects as a result of compression of the optic chiasma is a common presentation of macroadenoma. The patient may also present with headache, loss of libido, gynecomastia, decreased axillary and pubic hair, vomiting, stroke, and seizures. Computed tomography scan may demonstrate the mass, but magnetic resonance imaging with gadolinium is the preferred imaging modality for evaluation of hyperprolactinemia as it best describes the anatomy of the hypothalamic-pituitary area.
- Magnetic resonance imaging is best for the identification of a small prolactinoma (smaller than 1 cm). If imaging is able to confirm this patient's diagnosis of a prolactinoma, the tumor likely originated from the sella turcica.
- All patients with tumors adjacent to or compressing to optic chiasm should be referred for formal visual field testing. Cerebellar vermis tumors cause truncal ataxia. Posterior fossa can cause symptoms, which include headache, dizziness, nausea, and imbalance. Pontine lesions can cause a devastating locked-in syndrome.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Prolactinoma

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## Question 993:

A 45-year-old man is being evaluated for hyperlipidemia. A recent lipid screen revealed an elevated LDL despite maximum doses of rosuvastatin and ezetimibe. His medical history includes a recent myocardial infarction that was treated with a bare-metal stent about 3 weeks ago and peripheral artery disease that is currently symptomatic. The patient continues to smoke 1 pack of cigarettes per day. His medications include aspirin, clopidogrel, rosuvastatin, ezetimibe, cilostazol, carvedilol, and valsartan. On physical exam, the patient's vital signs are within normal limits. His BMI is 27 kg/m^2. Cardiac examination reveals a left femoral bruit and significantly diminished pedal pulses bilaterally. The patient's LDL is 132 mg/dL, HDL 55 mg/dL, triglycerides 245 mg/dL, and total cholesterol 239 mg/dL. What is the most appropriate management strategy for this patient?

## Choices:

1. Routine follow up
2. Smoking cessation only
3. Smoking cessation and addition of alirocumab
4. Smoking cessation and addition of niacin

## Answer: 3 - Smoking cessation and addition of alirocumab

## Explanations:

- For patients with very high risk for future ASCVD related events, who are already receiving treatment with maximum doses of statin and ezetimibe (and an LDL over 70 mg/dL or a non–HDL level over 100 mg/dL), it is recommended to add a PCSK9 inhibitor such as alirocumab.
- It is always recommended to stop smoking, no matter the age or comorbidities.
- A limitation of the PCSK9 inhibitors is the very high costs and injections needed every 2 to 4 weeks.
- Continuing atorvastatin and ezetimibe alone without any additional treatment will likely not reduce the patient's ASCVD risk any further. It will subsequently place the patient at high risk for future events.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hyperlipidemia

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## Question 994:

A 24-year-old female patient presents for a follow-up visit. She visited last month with complaints of oligomenorrhea, headache, abdominal pain, joint pains, and weakness. She was given symptomatic treatment and advised to come for follow up. The patient is still having the same symptoms and she has noticed a milky discharge from her nipples. Her physical examination reveals appropriate sexual maturity. Her investigations reveal serum calcium of 13 mg/dl. What is the mechanism of this patient's most likely disease?

## Choices:

1. Autosomal dominant inheritance involving menin gene
2. Autosomal dominant inheritance involving RET gene
3. Autosomal recessive inheritance involving menin gene
4. Autosomal recessive inheritance involving RET gene

## Answer: 1 - Autosomal dominant inheritance involving menin gene

## Explanations:

- The patient's hypercalcemia is most likely due to elevated parathyroid hormone and hyperprolactinemia is most likely due to parathyroid adenoma suggestive of an overall diagnosis of multiple endocrine neoplasia (MEN-1) syndrome.
- MEN1 syndrome involves the menin gene mutation.
- MEN1 gene mutations predominantly occur via autosomal dominant inheritance, however sporadic mutations are also possible.
- MEN2 gene mutations involve the RET gene and are predominantly autosomal dominant.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Multiple Endocrine Neoplasia Type 1

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## Question 995:

A 34 week gestational age infant was born to a mother with pregnancy-induced hypertension and diabetes mellitus. Apgar scores were 8 and 9 at 1 and 5 minutes, respectively. One day later, the neonate has a seizure and tetany. Select the most probable cause responsible for the findings.

## Choices:

1. Glucose of 42 mg/dl
2. Potassium of 6.0 mEq/L
3. Calcium of 6.0 mg/dL
4. Magnesium of 2.4 mg/dL

## Answer: 3 - Calcium of 6.0 mg/dL

## Explanations:

- Maternal illnesses such as hyperparathyroidism, toxemia, and diabetes mellitus can all cause neonatal hypocalcemia within the first 72 hours of life.
- Neonatal causes of hypocalcemia include respiratory distress, sepsis, hypomagnesemia, or prematurity-related low birth weight.
- The other lab values are normal.
- After 72 hours of age, hypocalcemia can be caused by high phosphate intake or hypoparathyroidism.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hypocalcemia

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## Question 996:

A 16-year-old female is brought to the clinic with increased thirst and salt craving. She does not take any medications. Vital signs are within normal limits. A physical exam is unremarkable. Labs reveal hypokalemia, hypomagnesemia, metabolic alkalosis, raised serum renin, and hypocalciuria. Previous genetic testing reports a mutation in the CLCNKB gene (which encodes chloride channel CLC-kb) but no mutation in the SLC12A3 gene (which encodes sodium chloride transporter). Which of the following of the patient's lab results confirms the patient's most likely diagnosis?

## Choices:

1. Serum potassium
2. Serum bicarbonate
3. Serum renin
4. Urine calcium

## Answer: 4 - Urine calcium

## Explanations:

- This patient has a mutation of CLCNKB, usually seen in Bartter syndrome but can also be seen in Gitelman syndrome.
- SLC12A3 mutation is usually seen in Gitelman syndrome but can also be absent in a minority of patients. SLC12A3 mutation is not seen in Bartter syndrome. Therefore, the genetic mutation tests in this patient do not help in confirming the diagnosis of this patient. We need to look at the other labs to help make the differentiation.
- Hypocalciuria is seen in Gitelman but not in Bartter syndrome. This confirms the diagnosis.
- Both Bartter and Gitelman syndrome patients have hypokalemia, metabolic alkalosis, and increased renin levels.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Gitelman Syndrome

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## Question 997: A patient is 1-day status post subtotal parathyroidectomy and reports twitching. What is the best treatment for the suspected underlying cause?

## Choices:

1. Oral vitamin D
2. An ampule of calcium gluconate IV
3. Intravenous diazepam
4. Oral cyclobenzaprine

## Answer: 2 - An ampule of calcium gluconate IV

## Explanations:

- Hypocalcemia can occur after surgery of the parathyroid glands. It may present as twitching or oral numbness soon after surgery.
- In a symptomatic patient, intravenous calcium gluconate can be administered to treat the symptoms.
- Severe hypocalcemia sometimes can cause hypotension or arrhythmias.
- Hypocalcemia can cause nervous system hyperactivity which leads to smooth and skeletal muscle contractions.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Hypocalcemia

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## Question 998:

A 65-year-old man with a past medical history of non-metastatic prostate cancer on androgen deprivation therapy with leuprolide, hypertension, and chronic kidney stage 4 underwent a bone DEXA scan that revealed a T-score of -2.7 in the lumbar spine and -2.9 in the total femur. His 25-OH vitamin D level is 22 ng/ml. He is prescribed calcium carbonate 1000 mg and cholecalciferol 2000 IU daily. What is the best option for the treatment of this patient?

## Choices:

1. Alendronate
2. Denosumab
3. Teriparatide
4. Zoledronic acid

## Answer: 2 - Denosumab

## Explanations:

- Denosumab is FDA-approved for preventing vertebral, non-vertebral, and hip fractures in patients with high risk for fracture who are receiving androgen deprivation therapy for nonmetastatic prostate cancer.
- Candidates for denosumab also include those patients who are intolerant or with contraindications to bisphosphonates, such as severe renal impairment. Therefore, this would be the most appropriate therapy for this patient.
- Bisphosphonates (alendronate and zoledronic acid) are anti-resorptive therapy and are contra-indicated in creatinine clearance less than 35 ml/min/1.73 m2. Bisphosphonates have shown to prevent vertebral, non-vertebral, and hip fractures, except for ibandronate, which only prevents vertebral fracture.
- Teriparatide, an anabolic agent, reduces the risk for vertebral and nonvertebral fractures but has not shown to reduce the risk for hip fracture. Because this patient has evidence of osteoporosis in both the lumbar spine and femur, this option would not be appropriate for him.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Osteoporosis In Males

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## Question 999:

A 64-year-old man presents to the emergency department with shortness of breath, rash, and fatigue for the past hour. He denies eating anything new and has never experienced these symptoms before. He says he was eating his usual breakfast when he developed these symptoms. Past medical history is significant for type 2 diabetes mellitus, asthma, hypertension, dust allergy, and papillary thyroid cancer. His medications include metformin, aspirin, lisinopril, and metoprolol. He was recently switched to exenatide by his family physician yesterday due to his continuous irregular blood glucose readings. His thyroid cancer was treated with partial thyroidectomy. His last asthmatic episode was 2 months back, which required hospitalization. His blood pressure is 90/70 mmHg, pulse is 100 bpm, he is afebrile, and respirations are 22/min. He has a 25-pack-year smoking history and drinks a glass of wine daily. Family history is significant for parathyroid carcinoma in his father and myocardial infarction in his brother. Physical examination shows multiple areas of raised, pruritic areas of skin. A chest examination reveals increased breath sounds. Which of the following is the most likely contraindication for the use of exenatide in this patient?

## Choices:

1. Previous history of papillary thyroid cancer
2. History of an asthmatic episode which required hospitalization
3. History of drug allergy
4. Possible hypersensitivity reaction to a component of the drug

## Answer: 4 - Possible hypersensitivity reaction to a component of the drug

## Explanations:

- The patient is most likely experiencing a hypersensitivity episode from a component or a formulation of the new antidiabetic drug, exenatide. Exenatide is contraindicated in patients with a known hypersensitivity to any component of the drug or formulation. The patient was recently switched to this medication and has not eaten anything new. The rash, hypotension, and shortness of breath suggest a hypersensitivity reaction.
- Exenatide is available as both solution and extended-release suspension for subcutaneous administration. Exenatide is a GLP-1 receptor agonist that acts to increase glucose-dependent insulin secretion from pancreatic beta cells, suppress glucagon secretion, delay gastric emptying, and reduce food intake.
- Side effects of exenatide include dose-dependent nausea, vomiting, headache, dizziness, and diarrhea. Medullary thyroid cancer, severe gastrointestinal disease, pancreatitis, and type 1 diabetes are contraindications to the use of exenatide.
- The patient's previous history of papillary thyroid cancer and asthma attack are not contraindications to the medication. Dust allergy is not a contraindication as it does not increase the risk for exenatide-induced reaction.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Exenatide

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## Question 1000:

A 35-year-old postpartum female patient presents to the clinic stating she was diagnosed about four months ago with a condition involving the pituitary gland that she cannot recall. She states she had undergone a biopsy of the gland and has the report with her. The report states that there was lymphocytic infiltration of her pituitary gland along with pituitary tissue being replaced by fibrous tissue. Which of the following is most commonly associated with her condition?

## Choices:

1. High ACTH secretion
2. Low ACTH secretion
3. Hyperprolactinemia
4. Hyperthyroidism

## Answer: 2 - Low ACTH secretion

## Explanations:

- Biopsy report shows that the patient has lymphocytic hypophysitis, which is a rare condition where lymphocytic infiltration of the pituitary gland secondary to autoimmune disease occurs, causing pituitary hormone production to be decreased.
- As the pituitary gland is infiltrated with lymphocytes the pituitary hormone production would be deficient accounting for low ACTH levels.
- With lymphocytic hypophysitis, one can see both hyper and hypoprolactinemia.
- Thyroid-stimulating hormone (TSH) production will be diminished from the pituitary gland, causing secondary hypothyroidism.

Go to the next page if you knew the correct answer, or click the link image(s) below to further research the concepts in this question (if desired).

## Research Concepts:

### Lymphocytic Hypophysitis

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- EMS-AEMT Intermediate
- EMS-Paramedic
- Naturopathic Part II - Clinical Sciences
- Occupational Therapist

- Lab-Phlebotomy Technician (PBT)
- Physical Therapy
- Radiology Technology
- Radiology Technology-CT
- Radiology Tech-Mammography
- Radiology Technology-MRI
- Radiology Tech-Nuclear Medicine
- Radiology Technology-Vascular
- Respiratory Therapist
- Social Work
- Speech Pathology
- Certified Surgical Technologist
- Sonography Technology
- EMS-Flight Paramedic
- EMS-Critical Care Paramedic
- EMS-Tactical Paramedic
- Physical Therapy-Neurology
- Physical Therapy-Geriatrics
- Physical Therapy-Orthopedics
- Physical Therapy-Pediatrics
- Physical Therapy-Sports
- Lab-Chemistry
- Lab-Blood Banking
- Lab-Microbiology
- Lab-Hematology
- EMR-First Medical Responder
- EMS-Community Paramedic
- Lab-Medical Laboratory Scientist (MLS)
- Lab-Medical Laboratory Technician
- Occupational Therapy Assistant
- Certified Surgical 1st Assistant
- Certified Hyperbaric Technologist (CHT)
- Naturopathic Part I - Basic Sciences
- Physical Therapy-Assistant
- Ob/Gyn - CREOG® In-Service
- Emergency Medicine - MRCEM SBA
- Optometry-Clinical Science
- Certified Anesthesiology Assistants

## Clinical Nurse Specialties

- CNS-Diabetes Management
- CNS-Adult-Gerontology
- CNS-Pediatric
- CNS-Neonatal

## Dental Doctor Specialties

## Graduate Specialties

- ACLS
- PALS
- International Trauma-ITLS

## Medical Doctor Specialties

- CNS-Anesthetist
- Adolescent Medicine
- Aerospace Medicine
- Allergy and Immunology
- Ambulatory and Urgent Care
- Anesthesiology
- Anesthesiology-Cardiothoracic
- Anesthesiology-Pediatric
- Advanced Trauma Support
- Cardiology
- Cardiology-Electrophysiology
- Cardiology-Failure Transplant
- Cardiology-Interventional
- Critical Care
- Dermatology
- Emergency Medicine
- Endocrinology
- Family Medicine
- Gastroenterology
- Genetics
- Geriatrics
- Hematology
- Hospice And Palliative Medicine
- Infectious Disease
- Internal Medicine
- Nephrology
- Neurology
- Neurology-Headache
- Neurodevelopmental Disabilities
- Neuromuscular Medicine
- Obesity Medicine
- Occupational Medicine
- Oncology
- Pain Medicine
- Pathology-Anatomic
- Pediatric
- Pediatric-Cardiology
- Pediatric-Child Abuse
- Pediatric-Critical Care

- Pediatric-Developmental
- Pediatric-Emergency Medicine
- Pediatric-Endocrinology
- Pediatric-Gastroenterology
- Pediatric-Hematology-Oncology
- Pediatric-Infectious Diseases
- Pediatric-Neonatal Perinatal
- Pediatric-Nephrology
- Pediatric-Neurology
- Pediatric-Pulmonology
- Pediatric-Rehabilitation
- Pediatric-Rheumatology
- Physical Medicine
- Psychiatry
- Addiction Medicine
- Psychiatry - Child and Adolescent
- Psychiatry-Geriatric
- Psychiatry - Consultation-Liaison
- Public and Preventive Medicine
- Pulmonary
- Radiation Oncology
- Radiology - Diagnostic
- Radiology - Musculoskeletal
- Radiology - Neuroradiology
- Nuclear Medicine
- Radiology - Pediatric
- Radiology - Physics and Safety
- Radiology - Vascular and Interventional
- Rheumatology
- Sleep
- SPEX
- Spinal Cord Injury
- Sports Medicine
- Cardiothoracic Surgery
- Colorectal Surgery
- Complex Surgical Oncology
- Craniofacial Surgery
- General Surgery
- Gynecologic Oncology
- Hand Surgery
- Ob/Gyn - Maternal-Fetal Medicine
- Neurosurgery
- Obstetrics and Gynecology
- Ophthalmology
- Oral And Maxillofacial Surgery
- Orthopedic Surgery

- Otolaryngology
- Pediatric Surgery
- Plastic Surgery
- Reproductive Endocrinology & Infertility
- Thoracic Surgery
- Urology
- Urology - Pediatric
- Vascular Surgery
- Toxicology
- Transplant Hepatology
- Undersea and Hyperbaric
- Radiology - Cardiac
- Radiology - Gastrointestinal
- Radiology - Breast
- Radiology - Genitourinary
- Radiology-Thoracic
- Radiology - Ultrasound
- Emergency Medicine EMS
- Compliance Physician
- Clinical Tropical Medicine
- Dermatopathology
- Dermatology-Pediatric
- Dermatologic Micrographic Surgery
- Pathology-Laboratory Medicine
- Pathology-Blood Banking Transfusion Medicine
- Pathology-Chemistry
- Pathology-Cytopathology
- Pathology-Forensics
- Pathology-Hematology
- Pathology-Microbiology
- Pathology-Molecular Genetic
- Pathology-Neuropathology
- Pathology-Pediatric
- Neurocritical Care
- Pediatric-Hospital Medicine
- Neurology - Epilepsy Medicine
- Neurology - Clinical Neurophysiology
- Wound
- Ophthalmology - Oculoplastic Surgery
- Brain Injury Medicine
- Vascular and Stroke Neurology
- Podiatry Medicine
- Podiatry Surgery
- Pelvic Medicine and Reconstructive Surgery
- Osteopathic Neuromusculoskeletal Medicine
- Neurology - Behavioral Neuropsychiatry

- Cardiology-Nuclear
- Cardiology-Echocardiography
- Cardiology-CV Computed Tomography
- Vascular Medicine
- Nutrition Medicine
- Quality Assurance and Utilization
- Facial Plastic Surgery
- Certified Hypertension Clinician
- Integrative Medicine
- Simulation In Healthcare
- Internal Medicine - MRCP UK and Ireland Part 2
- Internal Medicine - MRCP UK and Ireland Part 1
- General Surgery - MRCS Part A
- Family Medicine - MRCGP-Applied Knowledge Test
- Advanced Diabetes Management
- Spine Surgery
- COMVEX
- General Surgery - Inservice ABSITE®
- Correctional Medicine
- Pediatric - MRCPCH
- Emergency Medicine - FRCEM Primary
- Certified Hypertension Specialist
- Ophthalmology - Cornea & External Eye Disease
- Ophthalmology - Glaucoma
- Ophthalmology - Neuro
- Ophthalmology - Pediatric & Strabismus
- Ophthalmology - Cataract
- UK PLAB 1
- Australian Medical Council-IMG
- Canada MCC-QE 1
- Optometry-Basic Science
- Optometry-Advanced Medical Care
- National Board Dental Examination (NBDE) Part I
- Pakistan Medical Commission NLE

## Medical Student Specialties

- USMLE Step 1
- USMLE Step 2
- USMLE Step 3
- COMLEX Level 1
- COMLEX Level 2
- COMLEX Level 3
- Ambulatory Care-Medical Student
- Neurology-Medical Student
- Family Medicine-Medical Student
- Internal Medicine-Med Student

- Ob Gyn-Medical Student
- Pediatrics-Medical Student
- Psychiatry-Medical Student
- Surgery-Medical Student
- Emergency Medicine-Med Student
- Internal Medicine Advanced-Med Student
- Indian PG Entrance Exam-NEETPG
- Dermatology-Medical Student
- Clinical Diagnosis
- Anatomy-Medical Student
- Behavioral Sci-Medical Student
- Biochemistry-Medical Student
- Embryology-Medical Student
- Genetics-Medical Student
- Histology-Medical Student
- Microbiology-Medical Student
- Neuroanatomy-Medical Student
- Path Clin Lab-Medical Student
- Pathology-Medical Student
- Pharmacology-Medical Student
- Physiology-Medical Student
- Philippine Physician Exam (PLE)
- Statistics and Healthcare Economics
- Law, Medicine, and Ethics
- Pakistan-1st Professional
- Pakistan-3rd Professional
- Pakistan-4th Professional
- Pakistan-Final Professional
- Ophthalmology-Medical Student
- Indonesia CBT Final Examination
- Nepal Medical Council Exam
- Medical Council Nigeria (MDCN)
- Allergy - Medical Student
- Anesthesiology - Medical Student
- Cardiology - Medical Student
- Critical Care-Medical Student
- Endocrinology-Medical Student
- Gastroenterology-Medical Student
- Infectious Disease-Medical Student
- Nephrology-Medical Student
- Oncology-Medical Student
- Peds-Cardiology Medical Student
- Peds-Critical Care Medical Student
- Peds-Endocrinology Med Student
- Peds-GI Medical Student
- Peds-Hem Onc-Medical Student

- Peds-ID-Medical Student
- Peds-Neonatal Medical Student
- Peds-Nephrology Medical Student
- Peds-Pulmonology Medical Student
- Physical Medicine-Medical Student
- Pulmonary-Medical Student
- Diagnostic Radiology-Medical Student
- Rheumatology-Medical Student
- Neurosurgery-Medical Student
- Orthopedic-Medical Student
- Urology-Medical Student
- Otolaryngology-Medical Student
- Cardiothoracic-Medical Student
- Plastic Surgery-Medical Student
- Vascular Surgery-Medical Student
- Caribbean Medical Licensing Exam
- Peds-Surgery Medical Student
- Peds-Neurology Medical Student
- Osteopathic Manipulation
- Hematology-Medical Student
- Hand-Medical Student
- Sports Medicine-Medical Student
- ENARM Mexico Exam
- Pakistan FCPS (Basic Science)
- Pakistan-2nd Professional

## Nurse Practitioner Specialties

- NP-Acute Adult and Gerontology
- NP-Diabetes Management
- NP-Family
- NP-Psychiatric Mental Health
- NP-Adult-Geriatric Primary Care
- NP-Midwife
- NP-Pediatric Primary Care
- NP-Emergency Medicine
- NP-Women's Health Care
- NP-Acute Care Pediatric
- NP-Neonatal
- NP-Dermatology
- NP-Addiction
- NP-Nephrology
- NP-Oncology
- NP-Orthopedic
- NP-Advanced Health Assessment
- NP-Advanced Pharmacology
- NP-Advanced Pathophysiology

- NP-Advanced Physiology
- NP-Urology
- NP-Wound, Continence, And Ostomy
- NP-Advanced Neurovascular Practitioner

## Physician Assistant Specialties

- PA-PANCE
- PA-PANRE
- PA-Cardiovascular Thoracic
- PA-Emergency Medicine
- PA-Hospital Medicine
- PA-Nephrology
- PA-Orthopedic
- PA-Pediatric
- PA-Psychiatry

## Pharmacist Specialties

- Pharmacy-Technician (PTCB)
- Pharmacy-NAPLEX Review
- Pharmacy-Ambulatory Care
- Pharmacy-Critical Care
- Pharmacy-Nutrition Support
- Pharmacy-Oncology
- Pharmacy-Pediatric
- Pharmacy-Pharmacotherapy
- Pharmacy-Psychiatric
- Pharmacy-Infectious Disease
- Pharmacy-Geriatric
- Pharmacy-Cardiac
- Pharmacy-Applied Toxicology

## Nursing Specialties

- NP-Pediatric Mental Health Specialist (PMHS)
- LPN LVN NCLEX PN-Nursing Student
- NCLEX RN-Nursing Student
- Community Health-Nursing Student
- Adult Medical Surgical RN-Nursing Student
- Maternal Newborn PN-Nursing Student
- Child Health RN-Nursing Student
- Mental Health RN-Nursing Student
- Fundamentals-Nursing Student
- Mental Health PN-Nursing Student
- Pharmacology RN-Nursing Student
- Professional Ethics-Nursing Student

- Calculations-Nursing Student
- Maternal Newborn RN-Nursing Student
- Pharmacology PN-Nursing Student
- Adult Medical Surgical PN-Nursing Student
- Child Health PN-Nursing Student
- Anatomy-Nursing Student
- Physiology-Nursing Student
- Microbiology-Nursing Student
- Nutrition-Nursing Student
- Lab and Diagnostic Testing-Nursing Student
- Elder Adult Care-Nursing Student
- Critical Care Rhythms-Nursing Student
- Pathophysiology-Nursing Student
- Health Assessment-Nursing Student
- Nurse-Addiction (CARN)
- Nurse-Administrator NE NEA
- Nurse-AIDS-HIV (ACRN AACRN)
- Nurse-Ambulatory Care
- Nurse-Perianesthesia CAPA-CPAN
- Nurse-Anticoagulation
- Nurse-Bariatric (CBN)
- Nurse-Breast Care CBCN© Review
- Nurse-Cardiovascular CVN-CVRN
- Nurse-Case Management
- Nurse-Continence Care
- Nurse-Corrections (CCHP)
- Nurse-Critical Care (CCRN)
- Nurse-Dermatology (DNC)
- Nurse-Certified Diabetes Specialist
- Nurse-Emergency Certification
- Nurse-Flight Registered (CFRN)
- Nurse-Foot-Nail Care (CFCN)
- Nurse-Gastroenterology (CGRN)
- Nurse-Gerontology (NCA)
- Nurse-Hemodialysis (CHN)
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- Nurse-Lactation (CLA)
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- Nurse-Maternal Newborn (MNN)
- Nurse-Medical Surgical
- Nurse-Neonatal Intensive Care
- Nurse-Nephrology (CNN)
- Nurse-Neuroscience (CNRN)

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- Nurse-Oncology (OCN)
- Nurse-Operating Room (CNOR)
- Nurse-Ophthalmology (CRNO)
- Nurse-Orthopedic (ONC)
- Nurse-Otolaryngology (CORLN)
- Nurse-Pain Management (PMCN)
- Nurse-Pediatric (CPN)
- Nurse-Pediatric Critical Care
- Nurse-Pediatric Emergency CPEN
- Nurse-Pediatric Hem Onc (CPHON)
- Nurse-Inpatient Obstetric RNC
- Nurse-Plastic Surgery (CPSN)
- Nurse-Professional Development
- Nurse-Healthcare Quality
- Nurse-Progressive Care (PCCN)
- Nurse-Psychiatric Health
- Nurse-Radiologic (CRN)
- Nurse-Rehabilitation Registered
- Nurse-Risk Management (CPHRM)
- Nurse-Sexual Assault (SANE)
- Nurse-Transplant (CCTN-CCTC))
- Nurse-Transport (CTRN)
- Nurse-Urologic Registered
- Nurse-Wound Care
- Nurse-Eating Disorders (CEDRN)
- Nurse-Neonatal Transport C-NPT
- Nurse-Trauma (TCRN)
- Nurse-Emergency Pediatric Certification
- Nurse-Stroke Certified (SC-RN)
- Nurse-Wound Care and Ostomy
- Nurse-Wound, Ostomy, and Continence
- Nurse-Clinical Leader
- Nurse-Assisted Living
- Nurse-Vascular Access (VABC)
- Nurse-School (NBCSN)